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The Journal of Educational Psychology

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THE JOURNAL OF
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AN APPROACH TO THE SYNTHETIC STUDY OF INTEREST IN EDUCATION: PART I

DOUGLAS WAPLES

Tufts College

CHAPTER ONE—INTRODUCTORY

The difficulty encountered in the attempt to isolate any educational topic for discussion has been reassuringly defined by Professor Dewey: "The issues are so interdependent that any one of them can be selected only at the risk of ignoring important considerations, or else of begging the question by bringing in the very problem under discussion in the guise of some other subject. Yet limits of time and space require that some one field be entered and occupied by itself. . . . The difficulty is particularly great in the discussion of interest." Such being the case, it is necessary either to establish the most generally accepted limits of the field, or else to fix the bounds arbitrarily. To this end will be considered (1) the present occasion for investigation of the topic, (2) its aim, (3) the nature and range of previous investigations and sources, (4) the method of procedure, (5) the scope and definition of terms, and (6) the problems excluded from the discussion.

1. *Appropriateness of the Topic.*—Academic study of educational controls is probably more extensive at present than ever before in America, and attention to the by-products and methods of other sciences has done much to widen the approach, yet a comparison of the means employed to solve moot-points of theory in the United States with those of England, for example, will probably show the former to be more largely quantitative. This applies with equal force to problems of administration, supervision, and teaching. The quantitative approach is thoroughly justified by its results, by the necessity of dealing with large numbers, of substituting fact for opinion, and by

many other arguments no less conclusive. Yet however justified by results and prospects, the claims of the quantitative approach cannot be fully vindicated without the intervention of the devil's advocate, and it is this function that the present article seeks to fulfill. It is largely in the replies to the quo bono? that the value of real discovery becomes evident. It is then reasonable to expect some assistance toward further experiment from the analysis of inferential opinion regarding interest. Some corollaries of this assumption may be very generally stated.

(*a*) More concretely, there is need for some study—other than the single chapter of the standard text-books—to consider the contributions of the early child-study movement to the problems of interest from the standpoint of descriptive psychology. While these studies have doubtless been wisely evaluated and to some extent applied, further research should be stimulated by knowledge of the extent to which they confirm or invalidate empirical hypotheses.

(*b*) The hiatus which existed formerly between pedagogical studies of interest in the classroom, in particular studies, etc., and the purely speculative and philosophical descriptions of so-called social interests, "springs of action," etc., has within recent years been filled by the writings of the "Behaviorist" school. The influence of genetic psychology upon class instruction and courses of study has been largely stimulated thereby and has combined with the measurement movement to provide more adequate curricula and more effective methods both of teaching and administration. There have been few attempts to separate out and analyze the principles governing the growth of individual interest from the more general studies of individual differences in connection with normal group distribution. Such analysis should thus contribute to the effectiveness of the vocational guidance, problem-project, supervised study, and similar movements.

(*c*) The application of the psychology of psycho-analytic treatment of neurotics to normal individuals and to the principles of education generally is very rapidly winning the sanction of responsible writers on education. While the dangers attending direct application of the methods are at present prohibitive, there is reason to suppose that methods of instruction may profit by further studies of the unconscious. War-time analyses of normal individuals suffering from shell-shock have done much to eliminate the emphasis upon sex and to extend the field of application.[1] Of note in this

[1] *cf.* Dr. Southard's article: Mental Hygiene. *Hygiene*, Jan., 1920.

connection is the bearing of such studies upon the problems of repression of interest, the diagnosis of repressed interest, the general factor of interest, et al. Discussion of this evidence as applied to education has not, to the best of the writer's knowledge, been related to other data available.

(*d*) There is noticeable in the current discussions of the theory of interest a very natural prejudice against the "doctrine of interest." One evident effect of this prejudice in the United States is to restrict the discussion. Stated in very general terms, there is a tendency on the part of most writers to mediate between the two evils of "soft-pedagogy" and formal discipline, and to leave it to the quantitative estimate of results and the teacher's good sense to strike a happy compromise. While the remedy lies rather in evolution than research, it would seem advisable that the cause of such prejudice be analyzed, if other than the over-enthusiasm and dogmatism of certain Herbartians and Frobelians.

(*e*) Finally, it will suffice to mention the most inclusive justification for a study of this kind: namely, the importance of proper diagnosis of the pupils' interest as compared with other factors of the educative process. From the standpoint of secondary education the following remark of Inglis may be taken to represent the consensus of responsible opinion: "It is probably no exaggeration to say that the adaptation of secondary education on the one hand to meet the needs of different capacities, interests, and probable futures among pupils, and on the other hand to meet the differentiated needs of society, is the most important problem of secondary education at the present time."[1]

(*f*) In summary it may be observed that an investigation of interest may profitably be undertaken for the purpose of gathering together the results of studies made from many different points of approach. Upon such data it should be possible to form a more comprehensive and applicable notion of interest than that obtained either from general experience, from educational and philosophical theory, from descriptive and analytical psychology, or from attempts at quantitative measurement alone. Such a notion should contribute something to the existing theory and application of methods—if only the incentive to further and more conclusive research.

2. *Aim.*—The proposed study seeks first by selection from varied sources to identify and correlate certain psycho-physical and social

[1] Alexander Inglis: "The Principles of Secondary Education," p. 75.

elements of interest at successive stages of development. By extending the conception of interest to include the entire range of popular and scientific denotation, it will seek to indicate the nature, development, and effect of the significant forms of its expression. In this course certain relationships are noted which suggest an approach to the further investigation of their educational value. In the main this value should consist in a conception of general principles of motivation whose validity is dependent upon accurate diagnosis of interest. As applied both to the periods of school life and to the stages of instruction in a single subject, this expression of interest is obviously determined by the other chief factors in experience—thought or knowledge, and action. The final chapter, which outlines the educational bearing of those preceding, considers these determinants of motivation in order to indicate an approach towards standardization of the learning process. Only tentative conclusions are reached. Hence discussion of the study is rather descriptive than expository.

3. *Previous Investigations and Sources.*—It will be helpful here to distinguish briefly the main classes of contributory material by selecting certain representatives of each class by which the student can cover the field with the greatest economy of time. If the material be divided first into three general classes, the first (*a*) may include those works in which the analysis of interest is largely introspective. Among these may be further distinguished those with a direct pedagogical reference and those without. The second class (*b*) may include the various forms of descriptive psychology, ranging all the way from the results of laboratory analysis to accurate biographies of childhood and adolescence. The intervals in the range are marked by the divisions of purely analytic psychology, social psychology, and biological studies of various degrees of scientific tenor. The remaining class (*c*) for lack of a better term may be called statistical. Here belong the child-study and other investigations to determine by group analysis the nature of interest and the effect of various influences upon its expression. It should be noted that each of these classes is further distributed between the strictly pedagogical and the strictly psychological approach and also between the direct and the incidental study of interest. In spite of the greater difficulty of adaptation, the latter classes are generally speaking the more reliable.

(*a*) It is not surprising that the field of introspective psychology

is the one most fertile for the student of interest. We know that a particular feeling has certain qualities for us, but not why it has them. "Warmth and intimacy" have no objective criteria. Hence any account of the affective process which bridges the gaps of the physiological approach on the one hand and is free from a teleological bias on the other, is likely to square best with the facts and to provide the most satisfactory basis for further analysis. The statement is probably correct that no single mental trait has yet been adequately measured, and the inference as to the role of feelings which is based upon their expression under prescribed conditions must be confirmed by introspective judgment to win acceptance. Thus in spite of its generality and on account of its many points of contact with others, this field furnishes the ground work for the student of interest in education. Its important contributions are strictly in harmony with scientific method in that judgment is brought to bear upon all the facts of all the sciences pertinent to the subject of inquiry.

Of the directly pedagogical literature the basis is of course found in J. F. Herbart's *Outlines of Educational Doctrine*[1] and *Science of Education*,[2]—together with the critical accounts of Adams,[3] Graves,[4] and Tompkins.[5] Herbert's contribution to the study of interest consists in his rough analysis of the state itself,[6] in the relation of interest to other factors of the learning process and to the development of character, and in the move toward alignment of both sciences with wider teaching experience and observation. With the passing of the "doctrine" as a cult and the rapid development of analytic psychology, we have clearly distinguished what is valuable in the Herbartian theory from what is not.[7] The increasing recognition of the child plus the situation as the unit of

[1] Lange and DeGarmo's translation.

[2] H. M. and E. Felkin's translation.

[3] John Adams: "The Herbartian Psychology Applied to Education; The Evolution of Educational Theory," p. 322ff.

[4] F. P. Graves: "History of Education in Modern Times," pp. 198–220.

[5] A. Tompkins: Herbert's Philosophy and his Educational Theory. *Educational Review*, Chapter XVI, pp. 233–243.

[6] "Outlines," Chapter V; "Science of Education," Book II, Chapter III. The analysis here given is never entirely excluded from modern scientific accounts; *e.g.*, S. H. Rowe: "Habit Formation and the Science of Teaching," p. 136ff.

[7] As often emphasized, Herbart's chief inconsistency lies in regarding ideas as the psychological cause of interest and interest as the pedagogical means of obtaining ideas.

endeavor instead of the class, promises to release this valuable element from formalism—due rather to his disciples than to Herbart himself—and to interpret it in the light of fuller knowledge. It is thus in general true that contributions to the study of interest from the field of purely introspective thought consist largely in these interpretations of Herbartian principles modified and enriched by subsequent application and reflection. Dewey's monograph, *Interest and Effort in Education*, may alone serve to illustrate the real value of recent pedagogical works of this group. Conspicuous among the strictly psychological contributions by the "direct" method is W. Mitchell's *The Structure and Growth of the Mind.*[1] The analysis here made of interest as a factor in universal experience is probably the most inclusive and adequate to be found, and the comparatively invincible logic of the positions outlined recommends them as thoroughly reliable hypotheses where established fact is insufficient to provide suitable explanation of the behavior involved. Such confidence is further justified by the fact that the work is in no sense educational in purpose and the phenomena of interest are not isolated from other mental phenomena. As such it alone may represent the direct psychological approach.[2]

(*b*) It is difficult to select from the wide contribution of analytic and descriptive psychology to the study of mental traits. For the entire physiological approach to interest the following are essential: W. McDougall, *Physiological Psychology;* Th. Ribot, *The Psychology of Attention;* E. L. Thorndike, *Educational Psychology*, Vol. III; F. Arnold, *Attention and Interest;* and E. B. Titchener, *The Psychology of Feeling and Attention.* Such general treatments will frequently require reference to such works as G. F. Stout's *Analytical Psychology* and W. H. Howell's *Physiology.*

[1] London, 1907. The author distinguishes the direct (or introspective) explanation of experience as that mainly concerned with the growth of the mind through use, the indirect being concerned with the physical account of experience. For brief critical appreciation of Mitchell's treatment of interest see J. M. Baldwin: "Thought and Things," III: 13, whose "Genetic Theory of Reality" (1915) contains a further development of this treatment of interest.

[2] Although the entire range of critical and impressionistic writing belongs properly under this head. From among such brief treatments as will readily occur to the reader, the following may be mentioned as excellent:

W. C. Ruediger: "Principles of Education," Chapter XV.
P. Sandiford: "The Mental and Physical Life of School Children," Chapter XIII.
Strayer and Norsworthy: "How to Teach," Chapter III.
W. C. Bagley: "School Discipline," Chapter IV.
E. A. Kirkpatrick: "The Individual in the Making," Chapter II.

Distinguishing from the above such studies of interest as stress the biological and social aspects, one finds numerous secondary treatments that compare favorably with original investigations in scope and which of course are more readily adapted to educational application. The approach can probably be covered sufficiently by J. M. Baldwin's *Mental Development: Social and Ethical Interpretations;* K. Groos, *The Play of Man;* E. A. Kirkpatrick, *Genetic Psychology;* and W. McDougall, *Introduction to Social Psychology.* These should be supplemented by M. W. Keatinge, *Suggestion in Education;* J. Lee, *Play in Education;* H. Marot, *Creative Impulse in Industry;* M. Nicoll, *Dream Psychology;* G. Wallas, *Human Nature and Politics;* and W. A. White, *Mechanisms of Character Formation.* This material contributes to such fundamental topics as the source and role of interest in all activity, its familiar manifestations in the process of growth, the modification of normal biological tendencies resulting from social contact, and the implications of socialized expression.

(*c*) The caption "statistical" has been chosen to cover the great variety of studies—mainly educational in aim—which have recorded and compared the preferences, the environmental conditions, and the specific reactions of groups of children as means for diagnosing interest. The range of these child-studies by questionnaire methods from 1895 to 1905 may be readily observed from the indices of such journals as the *Pedagogical Seminary* and the *Child Study Monthly* for these years. Other methods include the enumeration of objects collected at different ages, analysis of compositions, inference from definitions of various objects and abstract ideas, from free drawings, from games, from ideas longest remembered, from verbal replies to prepared questions, and from observation of the child's reaction to pictures, stories, and other amusements. The two lines of study represented by Terman's *Measurement of Intelligence* and Link's *Employment Psychology* are defining quantatively some few "specificities" that enter into all interest and relating these to environmental controls. This approach, while chiefly of indirect value at present, is certain to contribute most eventually.

The fact that very few of such studies have made any real contribution to the theory of interest renders these few easy to distinguish. The method and value of three types of these latter may be briefly illustrated by Croswell's "Amusements of Worcester School

Children;"[1] Chapman and Fecler's "The Effect of External Incentives on Improvement;"[2] and Thorndike's "Early Interests; Their Permanence and Relation to Abilities."[3]

Croswell received 2,000 replies to a topical syllabus by which children were asked when, why, and what games and toys were played with and which were favorites. One thousand replies were received from each sex. These were tabulated under various heads to show by how many each amusement was mentioned and by how many it was preferred, of each sex. Each classification under this scheme is represented graphically by per cent and age to show "curves of relative interest." These indicate the growth of "special" interests and show the nascent periods in a number of groups. Thus "the curve of games of chase shows that only eleven per cent of all amusements mentioned by boys of six years are of this character, but at nine years they amount to over nineteen per cent and at sixteen they have fallen to less than four per cent." Each classification is carefully analyzed from many points of view and much collateral material is utilized to substantiate the conclusions drawn. The bibliography is entirely complete for 1899. Confidence is further justified by the fact that in many cases the teachers talked over the questions with the children, but what distinguishes the study from others of its type is the thorough analysis by other evidence. As a fair indication of the normal expression of genetic interests in one locality (seven schools from widely different communities were examined), it is a valuable supplement to such generalized evidence as that presented by Groos and other child biographers. By recording and classifying all forms of spontaneous activities, the data afford much more assistance in the analysis of interest than closer analysis of certain selected activities.

A parallel-group study based directly on elementary school practice was conducted by Chapman and Fecler (1917) to determine the effect of external incentive on rate of improvement in performance of school work. Assuming the close relation between interest and effort, two methods were employed,—the direct appeal to the subject's interest by showing its close relation to the desired activity, and the indirect or borrowed appeal of rewards and incentives external to the process itself. A group of thirty-six fifth grade boys and girls

[1] *Pedagogical Seminary*, VI:314–371.
[2] *Journal of Educational Psychology*, VIII:469–474.
[3] *School and Society*, V:178.

was divided and tested for nine successive days by Thorndike's simple addition test (ten minutes), Woodworth and Wells' cancellation test (one minute), and in substituting figures for numerals (five minutes). Incentive and stimulation were applied as follows:

GROUP A (In addition to B.)	GROUP B. (No stimulation except)
1. Each pupil's results published for previous day.	1. Informed of errors in addition.
2. Point marked in blue of previous day's performance.	2. Novelty of test.
3. General improvement of class shown by graph.	3. Interest in work itself.
4. Credits given in form of stars for improvement from last record and for position in class. Prizes promised at end of ten periods to fifty per cent who had most stars for efficiency and improvement.	4. Same conditions as those of serious school work.

The results, which are shown graphically, are somewhat impressive. The rate of improvement of the two groups varies directly with the length of the practice period in each operation. By the ninth period the motivated group stood ten points higher than the unmotivated, the points being awarded for each correct operation and subtracted for those incorrect. The diagnosis of individual interest responsive to such direct appeal and the standardization of the stimulus is clearly a study of the first importance.

While of no immediate significance in point of method, Thorndike's current investigation to establish a correlation between interest and ability may inspire effort to determine the causes for the variation[1] which will then offer an approach to the quantitative description of interest in terms of relatively measurable determinants. The remark seems almost superfluous that no affective state can be recognized objectively except by the inevitable movements accompanying it, between which and the state itself, in a given instance, the subject cannot distinguish any constant correlation.

[1] As will later appear, the compensating interest in deficiencies is probably constant and so would tend to reduce the correlation suggested by Thorndike as eighty-nine per cent. This wider variation, if established, must then be seriously investigated. But see Thorndike, *Educational Psychology*, III:360ff. for view of compensation consistent with the above text.

From the replies of 344 college students to a questionnaire calling for an indication of both interest and ability in the various studies in the last three years of elementary school, in high school, and in college,—the following ratios are computed:

	Results from 344 Individuals	Previous Results from 100 Individuals
Permanence of Interests		
Elementary school interest with high school interest....	r = .85	
Elementary school interest with college interest.....	r = .66	.66
High school interest with college interest.....	r = .79	
Permanence of Abilities		
Elementary school ability with high school ability.....	r = .83	
Elementary school ability with college ability.....	r = .71	.66
High school ability with college ability.....	r = .66	.6
Resemblance of an Individual's Order of Interest to his Order of Abilities		
In last 3 years of elementary school.....	r = .89	.89
In high school.....	r = .89	.89
In college.....	r = .89	.89

After making allowance for error, the author concludes "On the whole I believe that the correlations given above are approximately what an omniscient observer of these persons would have found. . . . As another case of special interest in practice we may take the significance of the reports of relative *interest* at 11–14, for relative ability at 21 or later, commonly later." This latter possibility certainly offers sufficient incentive to improve the methods by which real interests may be diagnosed more specifically to indicate promise, if it be established that their correlations with measureable abilities are low.

This hasty survey of sources should suggest the wide variety of approaches to the study and something of the relative and particular value of each type of material.

4. *Method of Procedure.*—The study to be outlined is based upon a three fold division of subject matter. There are other reasons for this division than that of mere convenience. Employing the familiar distinction between teaching, instruction, and education which identifies teaching with skill-training, instruction with the organization of knowledge by habit, and education with the modification of character

by the addition of ideals to the foregoing, we have a basis, largely hypothetical no doubt, for distinction between aspects of the process. Such distinction is further supported by the "three levels" of neural development. The concomitant activities of these are somewhat in agreement with the interests characteristic of each period as expressed in favorite amusements, etc., which, are assigned roughly to the mental ages birth to six, six to nine, and nine to fourteen. Still further it is convenient to group the data under the physiological, the biological and the sociological interpretations so as to furnish loosely corresponding treatments of (I) interest as a state of consciousness, (II) of its development in universal forms of expression, and (III) of the modifications in its expression hitherto regarded as instinctive which result from social contact. While it needs to be emphasized that development of interest like that of all mental traits is gradual and that distinct periods of growth in the various factors do not synchronize at the three stages in one individual, still it is believed that the theoretical analysis is in sufficiently close agreement with biological law to justify this plan of procedure.

5. *Scope and Definition of Terms.*—In order that the account may be as inclusive as possible, the term interest is interpreted in its literal sense to include all media of correspondence between the mind and the object, real or imaginary, of its contemplation. Subtracting thought and action from the course of experience, interest is what remains. Hence interest implies the emotional accompaniment of every attentive state without regard to the quality or intensity of the emotional tone. While this catholic and somewhat technical use of the term is partly restricted and partly justified as the discussion proceeds, it is believed that no other can be strictly in keeping with the purpose of the inquiry.

To prevent analysis in vacuo, certain hypotheses are here suggested in anticipation of their later development. It is important that some understanding be reached at the outset concerning the relation of interest to mental experience as such and to other phenomena of which it forms a part.

Assuming interest to lie entirely within the limits of the affective process by which knowledge and action are determined,[1] one may

[1] For authority in the same general terms *cf.* J. Jastrow, "What men do depends upon what they believe, and how they feel," "The Psychology of Conviction," p. 7, and also "Fundamentally beliefs are formed and held because they satisfy." *Ibid* p. 5.

first consider the relation of interest to feeling in general. Reduced to its simplest terms, the process of development begins with certain specific reactions to appropriate stimuli which the organism is prenatally disposed to feel. At this stage the affect forms practically the whole of experience which results from tendencies to experiment with various stimuli. At a later stage, when present feeling is modified by the results of former feeling, experience is determined by both. Interest, by hypothesis, is determined by the results of former feeling, *i.e.*, by experience. It should be noted that here such past experience is useful for merely specific ends. Organized response to a particular set of stimuli is not adapted to a different but similar set.[1] At a still later stage previous experience is so organized that reactions to usual situations are made with maximum ease and minimum feeling. Unusual situations are recognized as such and graded with respect to the intensity of the emotional response required. Such intensity is determined by the now habitual interests of the individual experience. Thus the inverse ratio of feeling and organized knowledge varies between pure feeling and complete knowledge. From this it may be observed that interest includes those elements of present feeling which combined with organic tendencies and associated elements of past feeling may be understood to determine the intensity, direction, and persistence of each attentive state. The investigation is then, in a sense, to analyze and explain these determinants with reference to successive periods of growth.

In order to identify forms of behavior resulting from these organic tendencies rather than from associated elements of past feeling, the distinction between interest and instinct deserves brief comment. It is clear that such distinction must be arbitrary since the functions of both overlap so considerably in any given experience. *Essentially the criterion is the degree to which the course of reaction is perfected.* Hence acquired instincts differ from organic instincts simply in that the latter direct the course of seeking without reference to previous experience. The development is therefore from instinct through interest to acquired instinct. This notion may serve here to avoid the con-

[1] Thus the boy who is first reduced to tears by the sight of his brother's chastisement and later by the mental picture of Simon Legree's lash across the back of Uncle Tom, has failed so to relate knowledge with feeling that a recurrence of the generic situation will provoke the same response—desire to avert suffering, perhaps—with decreased intensity of feeling.

fusion which must otherwise exist between so-called "special" interests and acquired instincts.[1]

It is desirable to make another distinction here for future reference. Both feeling and interest imply pleasure-pain, satisfaction and dissatisfaction, etc., as resulting from any situation toward which attention is directed. Both should however be distinguished from thought of such situation. The object as it is set before us, we think; the manner in which it affects us, we feel. Therefore by our interest in the object we refer to our attitude toward it, and we may think of this attitude as well as of the objective qualities. Interest in the object may be spoken of as a quality of the object and so included in our thought of it. A cheerful fire is thought of as a kind of fire that makes the beholder cheerful. Hence interest is often, yet not always, included in thought of a particular situation, but thought is not properly included in the interest.[2]

This distinction between interest in the object and interest in the thought of it is useful in defining what is referred to throughout as *type of interest.* By analogy with memory the question is often asked; there is interest, but are there interests?[3] The answer depends of course upon whether interest is considered as potential or as expressed in various situations. In the latter case it is evident that previous experience with a similar situation determines the subject's attitude both to the situation itself and to the thought of it. There is then a logical basis for a theoretical classification of such attitudes by types of experience. Furthermore since certain types of interest as distinguished by such attitudes are characteristic of each individual and so greatly affect his interpretation of environment, the discovery of the appropriate type and a knowledge of its limitations is the theoretical prerequisite of effective motivation. As distinguished in the analysis to follow the types are three: an intrinsic, which seeks

[1] This distinction is regularly ignored in popular studies of "the collective instinct," "the travel instinct," etc., and becomes tenuous as regards imitation, gregariousness, curiosity, et al.

[2] For elaboration of this distinction which is most important in educational practice and for the study of correlations between interest, knowledge and abilities, see W. Mitchell, *op. cit.*, pp. 64–65. The investigations of J. M. Cattell and others have established the fact that attention to an entirely uninteresting object is seldom longer than a minute's duration. This does not invalidate the above distinction.

[3] *e.g.*, G. E. St. John: Children's Interests. *Child Study Monthly*, 3: pp. 284–286.

indulgence of feeling toward the situation; practical, which seeks usefulness, or directs action towards the situation; and cognitive, which seeks meaning.[1] Each of these types is conceived to be differentiated by socialized expression so as later to bring certain elements into prominence that are comparatively negligible during infancy.

For further assistance in classifying interest in particular forms of activity the term *variety of interest* has been accepted as somewhat synonymous with "special interests" as the latter term is popularly used. There is, however, the difference that the variety of interest applies to that common quality of certain objects or activities which explains the subject's attitude toward them, in the sense that the attitude can only be known objectively as it is combined with thought of the object and so regarded as a quality.[2] "Special" interests are usually identified with the chosen activities themselves. While certain elementary varieties may occur in any type, those appearing later tend to find expression in appropriate types; though since the pure type probably exists only in abstraction, the truth of this statement depends largely upon the specific case.

It is recognized that without copious illustration, which space does not permit, the formal statements and diagrams of such general principles as the above may tend to obscure the facts they are intended to organize. It should therefore be emphasized at this point that the principles hereafter outlined are valueless except as applied to the specific situation. The situation can never be applied to the formula without danger of aeroplaning.

6. *Problems Excluded from the Discussion.*—(*a*) No attempt will be made to justify the theory of the concomitant development of

[1] After W. Mitchell, *loc. cit.* In general, the agreement among authorities in different fields upon this logical classification of interests is surprisingly close. Following Herbert's three-fold classification under the two divisions of "knowledge" and "participation," others who have employed substantially the same terms as the above are W. H. Kilpatrick: The Problem-project Attack in Organizing Subject-matter and Teaching, *N. E. A. Proceedings*, 1918, pp. 528ff.; J. Dewey: "Interest and Effort," Chapter IV; W. McDougall: "An Introduction to Social Psychology," p. 26; C. R. Henderson: "Principles of Education," p. 389; N. M. Butler: "Meaning of Education," p. 17, who distinguishes religious and literary from the purely intrinsic type; J. Welton: "Psychology of Education," p. 198; and P. Sandiford: "The Mental and Physical Life of School Children," p. 224.

[2] Hence novelty, interest, repetition and movement as well as the acquired instincts, curiosity, imitation, et al, are discussed as varieties of interest, since all serve to explain the expression of interest in particular as against the general expression distinguished by the type.

mental traits, the general validity of which, in contrast to the theory of periodic development, is assumed. This applies likewise to the rejection of saltatory development at adolescence. Without such reservations the enforced plan of discussion would superficially imply abrupt transition between stages of interest and the periodic appearance of varieties of interest.

(*b*) The theoretical nature of the discussion focusses attention upon the phenomena of interest as observable in groups. This should not lead to the assumption that individual differences are ignored which is one purpose of the study to explain. The first step in motivation consists in determining the varieties of interest in which expression is temporarily most intense and thereafter in such instruction as will evoke expression in useful content as the result of voluntary effort of attention. The principles derived from groups presuppose such individual study for their application.

(*c*) The question of the relation between coercion and appeal to direct interest is excluded on the grounds that the situation should determine the practice. The effects of coercion upon expression of interest are briefly treated.

(*To be continued*)

SOLUTION OF PROBLEMS IN GEOMETRY

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It is maintained by many that one of the chief factors in the solution of problems in geometry is the ability to visualize clearly and vividly the figure that will satisfy the conditions of the problem. To discover the extent to which visualization enters into such solutions, to determine the precise manner in which visualization functions, and to ascertain what other differences in behavior are found between those who excel in geometry and those who do poorly in it, were the purposes that animated the present investigation.

As a part of another study the Stockard-Bell tests in plane geometry were given to one hundred and forty-two freshmen students in the department of education of the University of Texas. The scores of these students ranged from 5 to 46 out of a possible maximum of 70. Assuming that these tests afford a reasonably accurate indication of attainments in geometry, the range of scores was wide enough to justify the conclusion that those having the higher scores might well be called "good" geometry students, while those at the bottom of the list would qualify as "poor" geometry students. Our intention was to take the highest five and the lowest five for intensive study, but for various reasons it was found impossible to secure for the experimental study those who stood at the very bottom of the list. The students ultimately available were the following.

Good group			Poor group		
Student	Age	Score	Student	Age	Score
GU	17.0	46	PD	21.0	20
GV	17.0	38	PA	20.0	11
GY	17.0	45	PB	18.0	14
GZ	18.0	28	PC	19.0	12
GX	19.0	34	PE	19.0	13
GW	19.0	30			
Average	17.8	37		19.4	14

It will be seen that while the average score of the good group is almost three times that of the poor group, the average age of the latter is almost two years higher than that of the former. This is quite in accord with other studies on elementary and high school pupils, and supports the generalization that in a given group classified by ordinary school progress the duller pupils are apt to be the older and the brighter pupils the younger. All the students participating in the experiment were girls.

The Tests

The material selected for the experimental work consisted of four exercises in plane geometry. Exercises I and III presented locus problems, Exercise II is the famous Binet test of the results of a wedge-shaped cut on the edge of a folded paper, and Exercise IV was one involving a simple geometrical construction. Exercise II was included because it appeals to what is traditionally called visual imagery, and because it was found by Kelley[1] to be more highly correlated with geometrical ability than any other test used in his analysis. The other three exercises were designed to afford room for original reasoning, and at the same time to enable the experimenter to observe the behavior of the subjects and to judge of their method of attack.

It soon became apparent that these exercises were too difficult for even the best students to perform independently. Since, however, the object of the study was not the mere performance of the tasks, but rather the analysis of the student's methods of attack, the difficulty of the exercises helped rather than hindered the attainment of the desired goal. If the problems had been such that the subjects could grasp their solution at a flash, the experimenter would have had to rely entirely on the introspective reports of inexperienced observers. Such introspection is apt to be quite untrustworthy. But where the subject has to halt and think carefully, it not only renders him more amenable to the questions of the experimenter, but also enables the latter to make a better comparison of the attitudes, habits of attention, persistence, certainty, etc., of the good and the poor groups. A list of suggestions was prepared for each exercise, to be given only when it had become apparent that the

[1] Truman Lee Kelley: Educational Guidance: An Experimental Study in the Analysis and Prediction of Ability in High School Pupils. *Teachers College Contributions to Education*, No. 71, 1914, p. 22.

student could go no further without help. The suggestions were arranged in such a way as to indicate by their efficacy something of the nature of the processes going on in the mind of the subject. They consisted of three groups, the first appealing to pure reason, the second to concrete imagery, and the third to immediate sensory experience or objective experiment. In this way the number of suggestions given furnished a significant index to the mental reactions of the subject.

The Directions

Exercise I

"In this exercise, which consists of a problem in plane geometry, and which I shall presently read, you are to solve the problem mentally, without using paper and pencil and without moving your hands. The problem will be read through twice, then you will be allowed two minutes in which to study it. You are not expected to solve it in two minutes: it will not be easy, but neither will it be excessively difficult. At the end of two minutes, you will be asked certain questions which you will answer as clearly and concisely as you can without moving your hands; *i.e.*, if you speak of a vertical line, do not move your hand up and down, or if you speak of a horizontal line, do not move the hand back and forth. Work as rapidly as you can, but do not hurry: think first, then speak. You must not use pencil and paper in any problem except when specifically directed. Do not ask any questions during your two-minute study period; in general, do not ask questions on any problem except when you are told to do so. Do not grow impatient if you desire to ask a question, as you will be given ample opportunity in due time. If you misunderstand anything, or forget something, do not ask questions; try to think it out by yourself, try to remember it without help, then whether you have succeeded or not, answer all questions as correctly and clearly as you can. We want to know what you think about the problem and how you think it, whether you solve it or not. Here is the problem. I shall read it through twice, and after two minutes, I shall ask you some questions which you will answer without moving your hands:"

"A straight line AB moves so that it remains parallel to a given straight line XY, and touches at one end a given circumference. Find the locus of the other end."

These instructions in their entirety were read to each subject that took problem I. The purpose of the instructions is sufficiently obvious without explanation; the main thing to notice is that they were uniform, as were also the questions and suggestions following the presentation of the problem. All the suggestions were given in the order above indicated until the subject succeeded in solving the problem.

QUESTIONS AND SUGGESTIONS

1. Repeat the problem just as it was read to you.
2. What is the locus of the other end?
3. How did you arrive at this conclusion?
4. Have you a picture in your mind of the figure as it would appear on paper?
5. Are the lines in your picture clear, can you see them plainly?
6. Describe your figure just as you see it in your mind.
7. Move your line AB so that the end touching the circumference is about 90 degrees from the starting point. Move it an equal amount twice more in the same manner.
8. Connect the points where the other end of the line has been.
9. How many sides has the figure thus formed? Is it regular?
10. What difference would there have been in the figure had you moved the line only 45 degrees at a time? and seven times?
11. Therefore, what limit would the shape of your figure approach as you lessened the distance you move AB each time? What kind of a line does the other end of AB generate as you move it under the given conditions?
12. Draw your figure on paper, using compass, ruler, and protractor.

(The examiner should here repeat the questions above beginning with 7 until the subject succeeds.)

13. (If the subject still fails to respond correctly, the examiner must go through an objective demonstration; but when this has been required, the student's reaction has been counted as a complete failure to solve the problem.)

We have said that the suggestions were arranged in groups. While the arrangement may seem at first sight arbitrary, it is not entirely so. Suggestions (7) to (11) inclusive plainly appeal to pure reason primarily. Hence, if a subject solves the problem with the aid of the 11th suggestion, he may be said to have succeeded with the use of pure reason alone. But if the 12th is required, it has been counted as due to a concrete suggestion. And if nothing but the 13th has availed, the solution has been accounted a failure, and the most effective suggestion as objective experiment.

Exercise II

"In this exercise you will use this square piece of paper. I have here another piece of paper, of exactly the same shape and size. I

am going to fold it a certain way, which you will notice carefully, and then I am going to cut out a piece while it is yet folded. Your problem is to find the exact appearance of my piece of paper when I unfold it. You will indicate your conclusions by drawing on your piece of paper the shape and position of the cuts as you think they will appear on my paper. Do not ask any questions until told to do so. Keep your hands still while the paper is being cut, and do not raise your paper from the table in front of you, nor in any way move it while solving the problem. Here is your problem:"

The experimenter places the square piece of paper with its sides vertical in full view of the subject. He folds it along the diagonal from the right upper to the lower left hand corner (as the experimenter faces the paper), so that the vertex of the lower right coincides with the vertex of the upper left hand corner. He folds along the other diagonal so that the lower left vertex coincides with the upper right vertex, and the left side coincides with the upper base; he folds along the vertical median so that the top base will be folded back over itself to the left, and the two diagonals will coincide throughout; now, beginning at the edge formed by the fold along the vertical median he cuts with the scissors in a line parallel to the bases about one and one-half inches, and from the end of this cut he cuts back to the median along a line parallel to the diagonals (the excised portion will thus represent a right isosceles); as soon as the cut is made he exposes it for three seconds, and lets the subject study it for two minutes.

Questions and Suggestions

1. "Without folding your paper, explain in detail how you have obtained your result. Tell me exactly how I folded and cut my paper."
2. "You have made a slight oversight. I am going to tell you exactly how I folded and cut the paper, and see if you cannot detect your error." (The experimenter will here give the stimulus verbally as written out above.)
3. (If the subject still misses the point, the experimenter will give the verbal stimulus again, accompanied by actual folding of the paper, but without cutting it.)
4. (If the subject still fails, let him go through the motions himself, up to the actual cutting, but without unfolding the cut paper.)

Exercise III

"You will treat this problem exactly as you did the first one." (Read the instructions of problem I). "Here is your problem:"

"A straight rod AB moves so that its ends constantly touch

two other straight rods which are perpendicular to each other. Find the locus of its middle point."

Questions and Suggestions

1. Repeat the problem just as it was read to you.
2. What is the locus of its middle point?
3. Have you a picture of the figure in your mind?
4. Describe this picture. Are the lines clear?
5. The median upon the hypothenuse of a right triangle is equal to one-half the hypothenuse.
6. In this problem we have a right triangle whose legs are variable but whose hypothenuse = K. Therefore the median = K/2.
7. Of how many movements is AB capable under the given conditions?
8. Move AB as far as it will go one way and mark its middle point and move it to its limit the other way and again mark its mid-point. What is the distance from the right angle vertex to each of these points?
9. Mark similarly several intermediate positions of the mid-point.
10. How far is each of these from O?
11. Does not each point with O determine the median of a right triangle whose hypothenuse is K? From (5) above what is the relative length of these medians?
12. Draw the figure. (The experimenter will now give the suggestions over again from (5).)
13. If the subject fails, give an objective demonstration, showing the relation to a ladder, etc.

Exercise IV

Give the Same Directions as in Exercise I

Through a given point P between the sides of a given angle ABC, draw a line terminated by the sides of the angle and bisected at P.

Questions and Suggestions

1. Repeat the problem as it was read to you.
2. What is your solution?
3. Have you a picture in your mind of the figure?
4. Describe this picture.
5. The line joining the middle points of two sides of a triangle is parallel to the third side and equal to one-half of it.
6. Suppose you have found the line. Then this line with the sides of the angle ABC makes a triangle, and its middle point is P.
7. Through P pass a line parallel to the lower side of the triangle.
8. How does this line divide the third side of the triangle?
9. What is the relation of the distance from this intersection to the vertex at B to the length of the whole intersected side?
10. Draw the figure carefully. (The experimenter will now repeat the suggestions above beginning with (6), until the subject succeeds.)

The Results

Some of the results obtained in this study require special explanation; and the method of their determination must be kept clearly in mind if they are to be correctly interpreted. In the first place, the term Memory indicates immediate recall, and was graded arbitrarily as follows: if the subject was able to answer question (1) at the first trial in a satisfactory manner, he was graded 100; satisfactory here meaning simply a correct statement of the problem, not necessarily verbatim. If the subject failed on the first trial, the experimenter read the problem again twice through just as the first time, allowed two minutes, then asked again question (1); if the student failed on this second trial, he was graded 75. If the subject required three trials, he was graded 50; if four, 25; if more than four, 0.

Under the term Behavior are included stability of imagery, facility of verbal expression, and inhibition of superfluous motor accompaniments. These are best illustrated by examples: GX, in the good group, in Exercise I, presented a striking case of very stable and clear mental images. When question (1) was put after the presentation of the problem, she gave a verbatim recall. When question (6) was put, GX fixed her vision on a certain part of the wall of the laboratory, and described her figure in faultless English just as though she were looking at a printed figure, and used letters without once confusing or misplacing them. It is to be noticed also that the clarity of GX's figure in no wise depended upon the external point of fixation. GX was asked to look at various objects and in every case her figures were as stable and clear as if she were looking at them on the blackboard. Such stability was graded 100. The grading of Verbal Expression for GX was equally easy. Her English was faultless and logical. Her verbal description of the figure was so clear and exact that any one could have reconstructed the figure from the first hearing. Her motor activities were well under control. The experimenter could not detect the slightest tendency to move any muscle except those of speech, and then only when speaking effectively. GX never left a word half spoken, nor used one incorrectly; but always thought out every word before hand.

On the other hand let us review the case of PD, in the poor group, in Exercise III. PD had images, but they had the serious fault of being entirely wrong. It took three presentations to enable her to recall unaided the words in which the problem was presented. A

remarkable thing was that each time PD was entirely confident that she was right, and was much surprised when told that she did not have the correct idea at all. When it came to the description of her figure, the experimenter was unable, even with the most exaggerated patience, to arrive at any definite conclusion as to just what the figure was. PD was profuse in confessing that she did not know herself just what she was trying to describe. The experimenter then described the proper figure and drilled her on it so that she could describe it independently with a certain degree of facility and accuracy. But no sooner was the work of solving begun than PD twisted her figure into a hopeless tangle. This lack of stability was given the grade 0. PD's English was very faulty and difficult to understand. Her verbal expressions consisted chiefly of timorous interjections, exclamations, and verbless and unfinished sentences. A mark of 25 seemed to represent fairly her proficiency in English expression. A striking thing about PD was her strong, uncontrollable motor tendencies. Contrary to directions, she immediately seized a pencil and began drawing lines as soon as the experimenter had presented a problem. This she continued to do in spite of repeated protests on the part of the experimenter.

Table I shows some rather interesting things. We see that the good group bests the poor group in memory by a score of 94 to 56, which is sufficient alone, if the scores are to be interpreted absolutely, to explain the difference in geometrical ability between the tw- groups. But it is in the second item that we find the most signifi cant indications. According to the results here expressed, the so-called visual tendency appears to be only moderately more pronounced in the good group. The difference in ability to use good English is far greater, and, in the opinion of the authors, is intimately associated causally with the lack of stability and lack of clarity in the visual manifestations. Still more significant is the difference in scores for motor accompaniments. All but one of the good group were able to inhibit undesirable motor activities quite satisfactorily, while not one of the poor group showed the ability to do so. In the case of the good student GU we have to do with a high degree of automatic motor activity that scarcely reaches the threshold of consciousness. She was always scribbling, and frequently had no idea of what she had written. This motor activity was accompanied by a distinctly inferior type of verbal expression, and was characterized by a considerable number of incorrect solutions.

TABLE I

Subject	Exercise	Memory	Behavior			Effective suggestions			Number incorrect solutions	Final correct solution
			Stability of imaginary	Verbal expression	Motor accompaniments	Pure reason	Concrete imagery	Objective experiments		
I. Good group										
GU.....	I	100	100	50	100	...	100	...	2	1
	II	100	100	75	100	...	100	...	1	1
	III	100	100	75	100	...	...	100	2	1
	IV	100	100	75	50	...	100	...	2	1
GV.....	I	100	100	100	0	100	...	...	0	1
	II	100	100	100	0	100	...	...	1	1
	III	75	75	100	0	100	...	...	1	1
	IV									
GW.....	I	100	100	100	0	100	...	...	1	1
	II	100	0	100	0	...	100	...	1	1
	III	100	100	100	0	...	100	...	2	1
	IV									
GX.....	I	100	100	100	0	...	100	...	1	1
	II	100	100	100	0	100	...	...	0	1
	III	100	100	100	0	...	100	...	2	1
	IV	100	100	100	0	...	100	...	0	1
GY.....	I	100	100	100	0	...	100	...	1	1
	II	100	50	75	100	...	100	...	3	1
	III	25	100	100	0	...	100	...	2	1
	IV	100	100	80	0	...	100	...	0	1
GZ.....	I	100	100	100	0	...	...	100	0	1
	II	100	100	100	0	100	...	...	0	1
	III	100	100	100	0	...	100	...	2	1
	IV	75	100	100	0	...	100	...	1	1
Average.....		94	92	92	20	27	64	10	1.2	1
II. Poor group										
PA.....	I	50	100	50	100	...	...	100	2	0
	II	50	100	50	100	...	...	100	3	0
	III	50	100	50	50	...	...	100	2	0
	IV	0	100	0	100	...	...	100	5	0
PB.....	I	100	100	100	100	...	...	100	3	0
	II	50	100	100	100	...	...	100	3	0
	III	100	100	100	100	...	...	100	3	0
	IV	100	100	75	100	...	...	100	4	0
PC.....	I	0	100	0	100	...	...	100	5	0
	II	100	100	25	100	...	...	100	1	1
	III	100	100	75	100	...	...	100	2	1
	IV	100	100	50	100	...	...	100	2	0
PD.....	I	50	100	0	100	...	...	100	2	0
	II	25	0	25	100	...	...	100	2	0
	III	25	0	25	100	...	...	100	0	0
	IV	75	75	0	100	...	...	100	2	0
PE.....	I	0	80	0	100	...	...	100	4	0
	II	25	0	25	100	...	...	100	2	1
	III									
	IV									
Average.....	..	56	75	42	97	...	...	100	2.6	17

On the whole it seems evident that the good students were able to inhibit their motor activities much better than the poor ones. Is this due to the greater motility of the poor students, and the lack of it among the good ones? From other observations it seems likely that there is little difference between the two groups in general motor tendencies, but rather that the good students remembered the directions and consciously suppressed tendencies to movement, while the poor group forgot all about them.

The results for the rubric Effective Suggestions seems to support this idea, especially with reference to the matter of breadth of attention and strength of memory. The poor group were not helped by the Pure Reason Suggestions nor by the Concrete Imagery, because they could not remember what was said. Probably this fault of memory was largely due to a lack of concentration on the matter in hand, to an inability to fasten the attention on the essential things, and therefore the inability to make fundamental logical associations. Without these, memory does not go very far and amounts to little as a factor in reasoning. But a weak and faulty attention works both ways; for in addition to making logical memory very problematical, it makes rote-memory useless. Suppose the subject has memorized a certain block of *logical* data in a more or less *rote*-fashion, as all the poor group memorized every thing they did memorize; now if the subject cannot fasten his attention on each essential in order long enough to examine accurately its full meaning and relations to the other elements of the problem, there is hardly a chance that he will 'bridge the gap' correctly. Hence we see that the poor group offered a multitude of incorrect solutions: these 'solutions' were only vague ideas which perhaps occurred to the good group as often and as incorrectly as to the poor group. The difference was that the good students had developed such a neural organization — had such a group of associations already formed that they immediately rejected these irrelevant ideas and sought for something more closely related to the conditions of the problem. This neural organization, this readiness to lay hold on the significant features of a situation and reject the irrelevant ones, seems to depend upon native tendencies that are far-reaching, and that have been built into life habits of accurately noting and recalling details, of care and precision in the use of language, and of conscious control of motor activities. Unless these life habits are already well formed, the prospect of developing a good geometer is not a very favorable

one. To what extent these life habits are developed by the study of formal geometry would be an interesting problem for experimental investigation.

The most striking difference revealed by the table is that in every case the good group reached a final correct solution, while in only three cases out of eighteen was this true of the poor group. Thus, so far as these exercises give any indication, the Stockard-Bell tests enabled us to select two groups, the one of which was distinctly superior, the other distinctly inferior, in geometrical ability.

Conclusions

1. Excellence in memory (for immediate recall) is very highly correlated with geometrical ability.

2. There was less observable difference in the quantity and quality of visual imagery than in any of the other elements compared; but the difference was in favor of the good group.

3. Excellence in verbal expression is very significantly related to ability in geometry.

4. Motor manifestations are exceedingly prominent in the poor group, and almost entirely absent in the good group. This may be due either to differences in motor tendencies, or differences in ability to control equally strong tendencies.

5. The poor group depend almost wholly on objective stimuli, and were most helped by objective suggestions.

6. The better memory of the good group may depend much on comprehension, but it seems closely related to more highly organized habits of neutral control.

7. The results of this study, in so far as they apply, show the efficacy of the Stockard-Bell Tests.

SUPERIOR CHILDREN—THEIR SCHOOL PROGRESS

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More and more the educational world is considering the needs of especially bright children. From many sources comes the assertion that whereas subnormal children are given training adapted to their needs in special classes, the supernormal child is not sufficiently studied. We are told that unless these clever children who are to be the intellectual leaders of the next generation are given work of a sort commensurate with their ability they are going to form indolent habits, their minds never working at full speed are going to become dull, and their promise remain forever unfulfilled. Furthermore it appears that in very few cases are these children graded in school where their ability would warrant. Even when an especially bright child is found to be the youngest in his class by several years, nevertheless a mental test reveals the fact that he is still two or three years lower than he should be. Obviously, so we are told, his mind is being untrained and his time wasted.

Enough has been said to rouse a considerable number of school authorities to action. Now most of our cities make some provision for the rapid promotion of their more gifted children.

The practical plans so far adopted for ministering to the needs of the bright child are based almost entirely upon the assumption that getting educated means covering certain ground—

e.g. Work with integers, fractions, decimals, percentage, etc.
Use of period, comma, apostrophe, quotation marks, etc.
Identification of noun, adjective, verb, etc.
History of the United States from page 1 to the end.
Geographical facts about one continent after another, etc.

Now in up-to-date parlance a bright child is a child with a high I.Q. This means that while living in the world a certain number of years he has attained the mental level of the average child who has lived a much longer period. Having this higher mental level it appears natural that he should be able to run swiftly along the educational road described above, while the average child walks sedately and the dull child plods painfully. Thus he may reach the decimal milestone and recognize verb-phrases while the child of lower I.Q. is just passing integers or approaching adjectives. Miss Elizabeth Irwin, who

has tested many hundreds of children in the New York public schools, states that a child with an I.Q. of 90 can frequently go through the public school curriculum grade by grade without repetition. Therefore with the same curriculum there is no way to provide for those with higher I.Q.'s except to get them over the ground more rapidly. It therefore appears that many children might and should be prepared for high school at the age of twelve and for college at fifteen, a result regarded as obviously desirable.

Probably the most usual method of attaining this short cut is to test the child "scientifically" and place him in a class with children whose average mental age corresponds with his. Of course this arrangement quite ignores character and emotional differences due to physical maturity or lack of it. Intellect is regarded as the determining factor and no difficulty is anticipated from placing the clever baby of ten with an I.Q. of 150 in a class with average 15 year old adolescent pupils.

A more discriminating method classes together children of the same life age and I.Q.'s very nearly equal, for example we find grouped in one room ten year old children with I.Q.'s 140 or 150, that is with a mental age of fourteen or fifteen years, thus approximating equality of mental ability without the discrepancies introduced by combining preadolescent and adolescent pupils. Implicit in this last method are two corollaries. The first of these is that the highly intellectual should be educated only with their own kind. This the writer challenges. With no opportunity in childhood to seek common ground with those of lower mental ability, how, in later life, are they going to have a wise and sympathetic understanding of and insight into the motives and mental processes of the average men and women whom they are being educated to "lead"?

The second corollary is that all high I.Q.'s approximate similar intellectual ability. This also the writer challenges. After we have averaged a 12 year old Ball and Field test, the 14 year Problems, 16 year Code, and 18 year Ingenuity test in one case, with a 12 year Vocabulary, 16 year old Fable Interpretation and Code, and 18 year Digits in another case, together with sufficient minuses and pluses to give in each case a 15 year old mental level, how can we assume an homogeneous mental grasp on all school work? When superior children have been studied more closely we may learn that the farther they rank above the average the greater their divergence from each other.

The writer has unusual oppcrtunity to study exceptionally bright children, and for several years has been pursuing this study with more and more definite purpose. Not only is the school in which she teaches one of very high standards, so that those of low mentality are automatically eliminated, but since it has been known that she was giving attention to this problem, a number of especially high I.Q.'s have been sent to her Department for that reason. At the present time out of 70 children under her care one has an I.Q. of 170, four are 160, several are near 150, and 140 is fairly common. Before discussing individual cases, however, it is necessary to compare the average mental ability of the pupils in this school with that of the public school population.

The Ethical Culture School of New York City strives to be consistently democratic. While the tuition rate places it among the most expensive schools of the city, it is required to have one third of its pupils free or enough pupils paying only partial tuition to equal one third free. No discrimination is made for race, color, religion, or economic status of the parents. The only requisites for entrance and retention of place are high moral character and mental ability to meet our very rigorous requirements. Sufficient mental testing has been done throughout the school to make it possible to state with fair definiteness the degree of intelligence thus measured which is necessary to cope with our conditions.

Last spring the Army Alpha tests were given to our entire high school. 98 per cent of the 209 pupils made a score of 90 or above, thus placing them above 14 years mental age. It must be remembered that only 30 per cent of the 1,700,000 drafted men in our cantonments attained this score.

362 tests with the Stanford revision of the Binet scale have been given in the last five years to children of the elementary grades. 174 of these were given by the writer, the remainder by other teachers in the school or by outside examiners employed for the purpose. These include children of every grade, except the Fourth, from the First to the Seventh, 295 of the cases being in the Fifth, Sixth, or Seventh grades. The median I.Q. is found to be 120. That is 50 per cent of our children have I.Q.'s above 120, whereas according to Terman only 10 per cent of public school children are above 120.

Experience has taught us that children with I.Q.'s near 100 will not be likely to retain their places in the school for more than a year or two, and has taught us to look doubtfully at anything below

110. This work has been going on so short a time that many of the children tested are still in the lower grades and therefore no reliable data can be compiled regarding the ultimate disposal of I.Q.'s of various groups.

The following classification indicates roughly the present situation of the children tested by the author in the last five years.

52 cases I.Q. 90–110.
- 52 per cent dropped by end of second year of high school, mostly by end of Seventh grade.
- 15 per cent moved away.
- 33 per cent still in school, but of these 47 per cent are unsatisfactory in their work.

36 cases I.Q. 110–120.
- 14 per cent have been dropped.
- 19 per cent moved away.
- 67 per cent are still in school and only two of these have ever been questioned.

62 cases I.Q. 120-140
- 10 per cent of these have been dropped.
- 11 per cent moved away.
- 74 per cent are still in school, apparently making satisfactory progress.

24 cases above 140 I.Q.
- 8 per cent dropped.
- 17 per cent moved away.
- 75 per cent still in school, apparently making satisfactory progress.

Many of our children are psychopathic and their tests accordingly more variable than the average. Nevertheless surprising stability in I.Q.'s is revealed by retesting. The Pearson coefficient of correlation of I.Q.'s in 82 cases retested after one year is .82. In 116 retests made in periods varying from a few months to 3 years, 75 per cent of the I.Q's were not altered more than 10 points. Therefore despite the skepticism of some critics, the tests are obviously a useful guide in predicting the probable continuance of a child in the school.

Continuing the investigation of our personnel I find that grade by grade the ages of our children do not differ greatly from those assigned as normal medians. In certain grades selected for the calculation because their mental tests were available for other comparisons, the relation was as follows:

	Normal age, years	E. C. S. age
Grade I	6.5	6.6
Grade II	7.5	7.67
Grade III	8.5	8.67
Grade V	10.5	11.0
Grade VI	11.5	12.2
Grade VII	12.5	12.6

With the life age of our pupils practically the same as is recognized as average for their respective grades in the schools of the country and the mental ages running higher than the average, one would naturally expect that our median scores in the standard pedagogical tests would be higher than the standard medians. Such has been found to be the case, although the results are frequently not so good in tests of speed and formal processes as of thought.

The results below were calculated for tests given to the 5th., 6th., and 7th. grades of my own Department last year. They are taken because fairly typical of such results in the school and because the mental ages and I.Q.'s of the same children for the same year are available and will be used later on. The figures indicate the number of years or fraction of a year that each grade is ahead (+) or behind (−) the standard it should have attained the preceding spring, the tests having been given within a few days after the opening of school in the fall, and no allowance being made for forgetting during the summer. For example, if the standard 5th. grade median score in a certain test was 20 and the standard 6th. grade median score was 30, and the E.C.S. 5th. median was 25, then that class would be .5 of a year advanced *i.e.*, + .5.

Courtis silent reading test

	Speed	Comprehension
Grade V	+2.67	+2.5
Grade VI	+4.00	+2.5

Kansas silent reading test

	Rate	Comprehension
Grade VI	+.8	+2.87
Grade VII	+.6	+2.33

Hahn's geography test	
Grade V	+.37 (Our Gr. IV has very little geography as distinct from other subjects.)
Grade VI	+1.13
Grade VII	Scale stops with Gr. VIII. but Gr. VII. was farther above Gr. VIII. standard than VI. standard median is above V. standard median. Perhaps we might count this score as +2 or +3 yrs.

Monroe reasoning tests.	Principle	Correct result
Grade V	+1.13	+1.23
Grade VI	+ .83	+1.2
Grade VII	+1.17	+1.08

Monroe diagnostic arithmetic tests	Rate	Accuracy
Grade V	− .41	+ .4
Grade VI	− . 3	+ .6
Grade VII	+ .17	+2.3

Such results as these have been quoted to show not only the high type of pupil in schools of this sort but also the high grade of work done. It is interesting, however, to investigate to what extent these results are commensurate with the mental ability of the pupils. The normal age for the grades in question at midyear being respectively IV. 9.5 yrs., V. 10.5 yrs., VI. II.5 yrs., VII. 12.5 yrs. (Page 6). If we add .5 of a year to ascertain approximately the life age of the same children in the spring we find it to be as follows,—Gr. IV. 10 yrs., Gr. V. 11 yrs., Gr. VI. 12 yrs., Gr. VII. 13 yrs. Using 120 as the median I.Q. and so calculating the spring mental ages of these grades we find them to be Gr. IV. 12 yrs., Gr. V. 13.2 yrs., Gr. VI. 14.4 yrs., Gr. VII. 15.6 yrs.

(By actual individual testing the mental ages last spring were found to be almost identical with these results, namely, Gr. V. 13.5, Gr. VI. 14.8, Gr. VII. 15.5).

In other words these children's mental age is in advance of their life age,—Gr. IV. 2 yrs., Gr. V. 2.2 yrs., Gr. VI. 2.4 yrs., Gr. VII. 2.6 yrs.

Now to return to the pedagogical tests, while Grade V. (using Gr. IV. rank for the preceding spring, although as a matter of fact the

mental age and corresponding ability to attack intellectual tasks was raised during the summer) was 2 yrs. above normal in mental age they were as follows in attainment,—

	Speed	Comprehension
Courtis silent reading test	+2.67	+2.5
Hahn geography test	+ .37	
	Principle	**Correct result**
Monroe reasoning tests	+1.13	+1.23
	Rate	**Accuracy**
Monroe diagnostic tests	− .41	+ .4

While Gr. VI. were advanced 2.2 yrs. in mental age their performance was as follows:

	Speed	Comprehension
Courtis silent reading test	+4	+2.5
	Speed	**Comprehension**
Kansas silent reading test	+ .8	+2.87
Hahn geography test	+1.13	
	Principle	**Correct result**
Monroe reasoning test	+ .83	+1.2
	Rate	**Accuracy**
Monroe diagnostic tests	+ .3	+ .6

Grade VII. advanced 2.4 yrs. in mental age made the following record:

	Rate	Comprehension
Kansas silent reading test	+ .6	+2.33
Hahn geography test	+2 or +3 yrs.	
	Principle	**Correct result**
Monroe reasoning test	+1.17	+1.08
	Rate	**Accuracy**
Monroe diagnostic tests	+ .17	+2.3

(These advancements in the pedagogical tests were calculated under the direction of Dr. W. A. McCall of Teachers College.)

With all allowance for error in interpreting these results it certainly appears at first sight either that these children are not being taught

with an efficiency proportionate to that given average children, or that school success is not so closely related to mental age as is commonly supposed.

One reply to the first alternative may be made at once,—that it is a matter of emphasis. As a school we give a smaller proportion of our time to the formal drill subjects which lend themselves to standard tests than do the public schools. Our "reading" is rather literary appreciation and widening of horizon. Our "English" is less formal grammar than the production of compositions of real literary value in both prose and poetry. Geography and history are taught by means of extensive projects involving independent research, wide collateral reading, comparison of authorities, and individual opinion. Mathematics means far less striving for speed and more the solution of problems, often those involved in real life situations. Experience has shown that it is not unusual for children failing to meet our requirements to prove themselves capable of attaining excellent results in public school classes.

But this alone does not explain the discrepancy noted above. We are led to believe that children of superior intelligence will excel the inferior either in formal or thought work, according to the sort of training to which they are subjected. In writing of very superior children (I.Q. 120—140) Terman says (Measurement of Intelligence, p. 96), "But wherever located, such children rarely get anything but the highest marks and the evidence goes to show that most of them could easily be prepared for high school by the age of 12 years." Naturally this would not be expected in the case of a high school where the average ability was greatly above the normal, but it would certainly appear reasonable that the performance medians of these children should far exceed those of the average, and also that those children with higher I.Q.'s should exceed in performance those with I.Q.'s less high even though far above the average.

Undoubtedly these assumptions are true in the mass. But after considerable intensive work with very brilliant children I have found many individuals to whom they did not apply. There are many causes, some readily discernible, others quite inscrutable, which prevent their successful application to a large number of individual children. One longs for the opportunity to see John Stuart Mill, Macaulay, and other classic examples of brilliant children placed in a conventional class-room. Would their superiority have been manifest in their early years? Or suppose we could travel back over the

years and test Pasteur, Darwin, George Elliot, and other minds of superior intelligence in adult life, who were reckoned dull as children. Would their I.Q.'s not have been high?

Turning once more to the Ethical Culture School, it was found that out of 174 cases in the elementary grades (whole classes from Grade I. to Grade VII. being taken without selection) 68 cases or 39 per cent were accelerated in life age, that is they were younger than the normal age for the grade in which they were working. Every one of these 68 children had an I.Q. above 100. 165 or 95 per cent of the 174 cases had an I.Q. of 100 or above, but only 41 per cent of the 165 cases (68) were accelerated in life age. Stated briefly all of the advanced children were bright but less than half of the bright children were advanced.

In the writer's own department last year the difference between the median mental age of Grade V. and Grade VI. was 2.6 years, between Grade VI. and Grade VII. it was .6, yet the range in mental age within the grades was as follows,

Grade V. 6.5 yrs. (9.5 yrs.——17 yrs.)
Grade VI. 5 yrs. (12 yrs.——17 yrs.)
Grade VII. 5.5 yrs. (13 yrs.——18.5 yrs.)

This astounding range in mental ability was obvious to a large extent to every teacher working with these classes. All knew that the difference in breadth of view and depth of understanding was tremendous, just as we realize it to be between our acquaintances in many relations of life. Yet this grouping was the final adjustment of the year after the teachers had shifted with almost perfect freedom all cases where it seemed reasonable to suppose that more profitable school work would be achieved in a higher or lower grade.

Not only does this mean a tremendous over-lapping of mental age, but it would be erroneous to suppose that within a single grade those above and below the median mental age uniformly attain results in their work above and below the performance median of their own grade.

Let us again examine the results of the standard pedagogical tests. If we count the individual children who were above the class median in mental age and below the class median in performance, and also those who were below the class median in mental age but above in

performance, we can form a rough estimate of the lack of correlation between mental age and success in formal school attainment.

The table which follows should be read thus, 30 per cent of the children who took the Kansas Silent Reading Test were above their class median in mental age and below in rate, or below the class median in mental age and above in rate. 35 per cent were inconsistent in the same way in their comprehension score. 64 per cent of those taking the Courtis Reading Test were above the class median in mental age and below the class median in rate or below the median in mental age and above the median in rate.

	Rate	Comprehension
Kansas silent reading.....	30 per cent	35 per cent

(In Grade VI. the four lowest in rate were all above median in mental age.)

	Rate	Comprehension
Courtis silent reading. Gr. V. and VI.....	64 per cent	36 per cent
Thorndike visual vocabulary.....	44 per cent	

	Rate	Principle	Correct result
Monroe reasoning test.	55 per cent	40 per cent	40 per cent

(In Grade VII. the highest child in rate and principle was lowest in M. A. and the lowest two in principle were second and sixth from the highest in mental age.)

Hahn's geography test.... 35 per cent

(Grade VII. the highest score was made by a girl who had the lowest mental age in the class and who was demoted within a month.)

	Rate	Accuracy
Monroe diagnostic arithmetic tests.....	46 per cent	48 per cent

This disparity is so great and so radically different from what one would be led to expect that I was impelled to pursue this line of investigation in a slightly different field.

Distribution tables were compiled to show the relation between the teacher's marks in each subject for a given class and the mental age, life age, and I.Q.'s respectively of the children of that class. In each case the Pearson coefficient was calculated. It was found that there was absolutely no significant correlation, the results being as follows:

Correlations with school marks

	Mathematics			Manual work			Penmanship		
	Grade			Grade			Grade		
	V	VI	VII	V	VI	VII	V	VI	VII
M.A.	−.045	−.19	+.33	−.01	+.055	+.14	−.41	−.012	+.28
L.A.	+.13	.....	−.13	+.207	+.45	−.16	+.05	+.304	+.40
I.Q.	−.076	+.14	+.35	−.17	−.19	+.10	−.15	−.10	−.046
Cases	19	18	22	18	19	21	19	19	22
	Composition			Spelling			History		
	Grade			Grade			Grade		
	V	VI	VII	V	VI	VII	V	VI	VII
M.A.	+.15	+.23	−.03	+.38	+.27	.00	.00	+.12	+.31
L.A.	+.04	+.08	−.55	+.15	−.09	−.38	+.04	−.12	−.29
I.Q.	+.12	+.16	+.24	+.29	+.19	+.29	+.02	+.18	+.46
Cases	19	19	22	19	19	22	19	19	22

(These coefficients were calculated for me by a student under the direction of Dr. W. A. McCall of Teachers College.)

All this would seem to indicate that within a single grade mental age, life age, and I. Q. are not constant determining factors in affecting school marks. Other factors are at work different for almost every individual case. It is now my purpose to leave the group generalizations and examine certain individuals.

In the three classes of my department last year 32 children were below their respective class medians in mental age. A careful examination of their individual records reveals the fact that in a number of instances these children made a considerable number of scores above the class median in the standard pedagogical tests (page 12). One child, third from the lowest in her class in mental age was above her class median in all the tests. Several attained average marks from their teachers. A few were never conditioned or questioned in any subject. Several were recognized as especially good in formal work, and 16 were above their class median in penmanship. Nevertheless

there were no glaring misfits in this group. On the whole their work and play and general reaction on life were consistent with their being in the lower 50 per cent in a mental age ranking, including the little girl cited above who was above the median in all pedagogical tests and yet conspicuously lacking in thought power. 5 out of the 32 failed of promotion at the end of the year and 2 were dropped from the school. 4 were especially delicate in health.

Of the 32 cases above the class medians in mental age there were not many who did not present some peculiar problem during the year or who had not experienced some special difficulty earlier in their educational career. 17 were below the class median in penmanship, 5 of this number being so extremely poor in writing as to find this a handicap in all their work. They were unable to write more than a small proportion of what their class accomplished in a given period.

According to their teachers' rating something over a third were prominent for their so-called "laziness," that is they were recognized as never doing the best work of which they were capable, some of them manifesting no conscience whatever in the matter. About a third were especially frail in health. Half a dozen were keenly intellectual but saw no value in working things out to an accurate conclusion after the principle was grasped. They were inclined to be scornful of the less brilliant thorough worker. In some cases this natural tendency has seemed to us to have been accentuated by the exploitation of Rapid Advancement classes with their stamp of smug, self-satisfaction. As one such child said, "I'm pretty careless but I always know how to do things. Yes, I've always been told I was a very bright little girl. I've skipped grades twice." Half a dozen were either antagonistic or of pronounced immaturity in their grasp of social situations and responsibilities. For a combination of these reasons it was deemed necessary for five to repeat their grades and for three to be sent to other schools. It was curious to note that in two of the grades, the highest and lowest respectively in mental age failed of promotion or were sent elsewhere, while in the other grade the lowest two and the two just below the highest were eliminated or made to repeat. 8 out of the 32 would come under Terman's characterization of high I.Q.'s, that is they were so all round perfect in accomplishment that one would like to kidnap them. Nevertheless even out of this number 3 were extremely frail in health and in regard to the whole 8 any one of their teachers would say that they were no more likely to be prominent in adult life than many of the erratic children whose early school work is more difficult.

Of the 32 pupils below the median age 7 had I.Q.'s of 120 or above, that is they were at or above the median I.Q. of the School. This was because they were so young in life age that even with an I.Q. as high as 139 in one case the mental age was still below the median. On the other hand of those 32 above the median mental age only 3 had I.Q's. below 120.

The following are individual descriptions of children in the upper 50 per cent on a mental age ranking who seem to us to stand fairly well as type studies of superior children whom we have known:

1. Life Age: 10.4. Mental Age: 13.2. I.Q. 126

Below class median in Rate in Monroe Reasoning Test, Courtis Reading Comprehension score, Penmanship (Thorndike Scale). Above standard median in Height, Weight, and Grip.

A strange unsocial child, hovering about the teachers but not mingling with the children whom she was anxious to help but with whom she did not know how to "take hold." Ill a great deal. Did poor meagre work. Repeating grade this year and much improved in general attitude.

2. Life Age: 12.2. Mental Age: 15.9. I.Q. 131

Below class median in rate and principle of Monroe Reasoning Test, Hahn Geography Test, and Penmanship. Below average in weight and height, but above in grip.

A little girl who seemed to try but always did some strange freakish thing before the exercise was finished. Extremely nervous. Apparently not disliked but never has any real friends. Was promoted conditioned in Mathematics. She has gained considerably in self-confidence this year and is doing somewhat stronger work.

3. Life Age: 11.4. Mental Age: 16.4. I.Q. 144

Below median in penmanship and Courtis Reading rate. Above average in height and weight but below in grip.

A boy of brilliant mind who never did as well as he might because of sloppy, untidy papers, and inaccurate work. Hands almost useless. Could never see what difference a small mistake made if the principle was correct. All drill work for accuracy was irksome. Did not seem to know how to play with children. Fell into hysterical sobbing if teased or crossed in a game. No pronounced change this year except that his attendance is more irregular due to frequent colds and attacks of indigestion.

4. Life Age: 12.4 Mental Age: 17.3. I.Q. 140

Below median in everything except Hahn Geography and Rate score in Reasoning and Courtis Reading.

Physical Measurements not taken.

Boy. Dropped from School as failure both academic and social. Did not know how and apparently could not be taught how to try consistently.

Much disliked by his class mates.

5. Life Age: 12.8. Mental Age: 17.7. I.Q. 139

Below median in Monroe Reasoning Test Rate score but highest in correct result. Below in Penmanship.

Above average for age in height, weight, and grip.

A bright girl but unwilling to work. Extremely antisocial, seeming to delight in causing the unhappiness of others. Contradictory attitude.

A problem at home and at school.

6. Life Age: 11.25. Mental Age: 16.2. I.Q. 144

Below class median in Geography Standard Test and Penmanship.

Below average in Height, Weight, and Grip of both hands.

A very brilliant boy. Frail in health. Lacking sense of social values.

No interest in class government. Unable to meet practical situations.

Born an absent-minded professor.

When just eleven years old, started to paint bottom step of stairway first. Increasingly self-centered and brilliant this year.

7. Life Age: 14.3. Mental Age: 18.1. I.Q. 126

Below median in all scores of Monroe Reasoning Test.

Above average in Height, Weight, and Grip in both hands.

This boy showed excellent grasp of all subjects, including mathematics, but utterly refused to do any work, outside of class room stimulation.

A remarkable social leader although selfish and lacking in affection for anyone. Was put out of the school as an all round failure.

8. Life Age: 12.2. Mental Age: 16.25. I.Q. 134

Below median in all Standard Tests except Comprehension Score of Courtis Reading Test.

Above Life Age Average in all Physical Measurements.

Boy of very psycopathic inheritance. Always saw things at a different angle from other people and could not do them in the obvious way as taught. A great reader and original thinker. Upright character and high ideals but restive under any authority and therefore contradictory.

An interesting boy but very difficult to get over the grade requirements.

Much respected by the other children but never quite one of them.

Greater poise and normality of thought this year.

9. Life Age: 11.5. Mental Age: 16.1. I.Q. 140

Below class median in Penmamship, Rate of Courtis Reading Test, and Principle in Monroe Reasoning Test.

Above Life Age Average in Physical Measurements.

A girl who seldom volunteered. Would sit out any number of periods in silence unless prodded. Good natured and kindly but indolent even in well doing. Conscientious but without ambition. Liked to please teachers but had absolutely no intellectual interest in work.

10. Life Age: 10.6. Mental Age: 17.2. I.Q. 162

Below class median in all pedagogical tests except Principle Score in Monroe Reasoning Test.

Above Life Age Average in Height, Weight, and Grip of both hands.

This boy was a problem in all directions. Left handed, wrote so slowly that only a few lines were finished in a period. Reading slow and labored. Got thought subjects only by having them presented directly by a teacher. Cared nothing for intellectual side of school life. The entire year was one of urging, tutoring, and checking up neglected tasks between home and School. He was not promoted. This year no improvement is apparent.

11. Life Age: 9.8. Mental Age: 15.6. I.Q. 159

Below class median in Penmanship and Geography, (due to slowness in writing as he is almost perfect in Geography). Lowest in class in Rate Score in Courtis Reading but 100 per cent in Comprehension.

Below Life Age Average in Height, Weight, and Grip.

A very remarkable little boy. Normal infancy. Virtually taught himself to read by three and a half years. When first brought to us was extremely nervous—restless—facial twitching—difficulty in

going to sleep at night. Had been forced from grade to grade in Rapid Advancement Classes. Entered our Fifth Grade a few weeks after eighth birthday. He was in the Sixth Grade last year. Remarkable in all thought work except History, excelling expecially in Science. Good muscular control for his age but so much less than children of his class that he was relatively poor in penmanship, manual work, and games. Not anti-social, indeed a very loving spirit but that of a very little boy. Immature even for physical age, so that he failed to grasp social situations, student government demands, the rules of group games, and was often babyishly unhappy because of this. A physical coward, always afraid that the ball would hit him or that he would be knocked over. Despite a remarkable memory for facts and names, he could not grasp the import of big human situations in the past. While he could easily have been pushed into High School for Science and Mathematics, he failed in Sixth Grade History. Perfect in formal English he had no literary message for the world which would enable him to cope with the composition of his grade. He was kept busy with extra games, formal gymnastics, manual work, and advanced science, and the academic deficiencies in his grade slurred, it being definitely planned for him to repeat the grade. This year he is among the best in all subjects and is playing heartily and boyishly.

12. Life Age: 10.6. Mental Age: 15.5. I.Q. 146

Below class median in all tests except Geography, Courtis Reading Comprehension, and Principle in Monroe Reasoning.

Above Life Age Average in all Physical Measurements.

Boy from cultured home, slow in all motions. Late for nearly all exercises.

Extremely poor in penmanship. "Lazy." Mind on nothing but play. When forced to work became very nervous at night. A hearty, lovable nature.

Failed in all subjects. Is repeating this year and showing qualities of a real student.

13. Life Age: 11.7. Mental Age: 15.6. I.Q. 134

Below median in all standard tests except Geograghy and Courtis Comprehension.

Below Life Age Average in all Physical Measurements.

A very bright little boy, able to excel in all work but dropped as

a complete failure because he would not apply himself. All play and mischief with no earnestness or sense of moral responsibility.

14. Life Age: 12.3. Mental Age: 17.5. I.Q. 142

Below class median in all standard tests except Reading and Geography.

Below Life Age Average in Height and Grip, and above in Weight.

A very brilliant, erratic boy, excellent in thought, inaccurate in execution. Remarkable literary expression. Poor concentration except where strong personal interest led. Alive on all questions of the day, and keenly sensitive to social responsibilities within the class group.

15. Life Age: 13.2. Mental Age: 18.3. I.Q. 139

Below median in Penmanship and Rate of Monroe Reasoning Test.

Above Life Age Average in all Physical Measurements.

A little girl with apparently great willingness to work yet poor in all lessons through losing papers, failure to follow directions, working wrong assignments. Failed to make her promotion. Excellent social spirit and qualities of leadership. Is repeating her grade with greater earnestness and somewhat greater success.

16. Life Age: 10.7. Mental Age: 16.1. I.Q. 151

Below median in Geography and Penmanship.

Above average in height, weight, and grip.

A boy of charming personality, sturdy in physique, loved by class mates, a good sport, an ambitious, original, and successful student.

17. Life Age: 12.6. Mental Age: 18.5. I.Q. 147

Below class median in Penmanship.

Boy. Loved by everybody. Did not care for play. Rather the typical student. Frail in health.

Below average in height, weight, and grip.

18. Life Age: 9.75. Mental Age: 13. I.Q. 133

Ill when standard tests were given.

Below average in weight and height; above in grip.

This boy is a satisfactory student with pronounced qualities of leadership. Remarkable for his cooperation with both teachers and pupils. Frail in health.

(Several of the exceptionally high I.Q.'s referred to on page 3 are not included in this account because they are new this year.)

The foregoing exposition of our experience with superior children certainly indicates that the answer to the inquiry what is to be done with them does not consist in speeding them along the educational track.

There is no doubt that up to a certain point intelligence is the determining factor in a child's school career. That is to say if he does not have intelligence he cannot use it. Patience, care, good formal work, etc., will often carry him much farther in acquiring the elementary tools than is commonly supposed but a child with an I.Q. under 110 is not usually going far into the realms of abstract thinking.

On the other hand the possession of intelligence does not insure its steady and successful application. It may be the most important signal factor in academic success but it is not enough. If we premise that all children with I.Q.'s above 110 are potential academic successes we must not expect a full realization of this success, especially not in the elementary grades. A difference of I.Q. between 70 and 80 or even between 90 and 100 manifests itself unmistakably in a child's comprehension of school work. On the other hand a difference of 10 points above 120 is negligible whereas attitude and will power often tip the scale. In other words, attainment does not steadily advance as I.Q.'s grow higher.

I. Many high I.Q.'s are poor in muscular control. Undoubtedly this is exaggerated in the teacher's mind from the fact that muscular development correlates with physical rather than with mental age. Therefore a child of eight who writes or plays or performs formal gymnastics normally for a child of eight is handicapped if asked to compete with children of ten or twelve who may be his equals in mental age. Our experience also leads us to believe that a considerable number of very bright children are deficient in muscular control even for their life age. This is a great handicap in meeting our modern school requirements. Such children may think out problems which can never be worked, plan compositions, or know the answer to history or geography exercises which can never be written because of slow execution. The prescription here indicated seems to be an unusual amount of hand training.

II. A very considerable number are counted as "lazy" at least through their early childhood. They like to read and to listen to grown up conversation which they often join with intelligent questions or com-

ments, but they will not apply themselves to "dig." Their minds are on play or on personal projects. Frequently this is a normal and most desirable protection. They are preserving their excellent minds from the conventionalizing influences of the school. In early adolescence there is sometimes a sudden awakening and a student evolves from the indifferent child. Now and then a highly educated parent says of such a child, "Let him alone. I was just the same until I was fourteen. Then I suddenly wakened up and got ready for college in two years."

On the other hand we all know brilliant failures in the adult world, men and women with unusual intelligence who never settle down to anything. Can we learn to reduce their number by a wiser handling of this difficult type of child?

III. Then there are those very inaccurate children who always know how the thing should be done but never do it, who can explain the most involved problem, but in working say, seven plus eight are thirteen. They are quite unimpressed by the seriousness of this trait since to them the only essential is to know how. They conceive great plans in manual work, wonderful designs in art, excellent plots for stories but the hand falters, the purpose wavers, the execution fails. Some overcome this tendency sufficiently to do excellent work in high school or college where the formal processes are of less relative importance. Others are always inaccurate themselves but make good directors with secretaries and clerks to do the work. In some cases this quality means that they can inspire others by a vision of perfection which they can never attain. As one of the patient plodders is represented as saying of the genius,

> "There burns a truer light of God in them,
> In their vexed, beating, stuffed, and stopped-up brain,
> Heart, or whate'er else, then goes on to prompt,
> This low-pulsed forthright craftsman's hand of mine.
> Their works drop groundward, but themselves, I know,
> Reach many a time a heaven that's shut to me,
> Enter and take their place there sure enough,
> Though they come back and cannot tell the world."

In the elementary grades where the acquiring of tools is the main object, this type of child falls in attainment far below the level of his mental ability.

IV. Then there are those children whose maturity of judgment especially in matters of human relationship, not only fails to keep pace

with their intellectual growth but, as we feel, with their life age as well. If they are advanced much beyond children of their age they are unhappy themselves and become annoying to others through their foolish babyish attitude. Social life with their peers is their crying need and intellectual nourishment must be given in broader fields of collateral research rather than by crowding them up to greater social disparity.

V. Our experience has shown us that a large number of very bright children are neurotic and that their great need is not intellectual stimulation but the calmest, most vegetative life that modern civilization can afford. Like throbbing engines their minds beat on far into the night, and unless helped to slow down will beat themselves out long before maturity.

VI. All the above types are problems, many of them moral problems but the last type I shall name is the gravest moral of all. The keenly intellectual person is almost invariably egocentric. He works for the joy of the intellectual activity and he works for himself and his own advancement. Fond parents, doting relatives, admiring classmates, proud teachers all contribute their share of exploitation and foster the child's belief in his own remarkable powers and his scorn for the stupidity of "the others." Rapidly advanced among pupils older than himself, he becomes their pet and toy or occasionally the object of their jealousy. Segregated with others of his own age and type, he is isolated from the common herd of ordinary minds. The engrossing thought of all about him is how to plan his brilliant career and help him to strut across his little stage. The idea of service, of responsibility, because of his special gifts is almost impossible to inculcate both because of his inherent make up and because of the odds against him in the attitude of others.

The problem of meeting the needs of the brilliant child appeals to me preeminently as a moral problem, a problem in the preparation for service of the highest order. Rapid advancement is not the patent recipe. We need long and painstaking study of the different parts of the curriculm and the exact qualities, mental and physical demanded by each. We must learn to supply sufficient mental nourishment to the precociously active mind, without at the same time demanding concepts, self control, and execution which only the experience of years can give. Only so can we assist these children to develop their talents in accord with their high promise.

Astounding prodigies which can only be described with superlatives

are of little value to humanity unless they can be endowed with practical efficiency and acquire magnetic power to attract their less gifted brethen and so become leaders of the human race "on toward the heights."

(Grateful acknowledgement is made to Dr. Edgar A. Doll of the Department of Institutions and Agencies at Trenton, New Jersey, for his unfailing kindness in advising with reference to the arranging of this data and the statistical handling of the same; and also to the three teachers associated with me in my department but for whose earnest labors and sympathetic insight into varying types of personality, the close study and understanding of these children would not have been possible.)

"HOW TO STUDY" AS A SOURCE OF MOTIVE IN EDUCATIONAL PSYCHOLOGY

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AND

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How to study was the chief centre of interest and source of motive in a course in educational psychology in the University of Illinois the first semester of 1919–1920. This work was given as an undergraduate course, the prerequisites for which were junior-senior standing and Education 1 or Psychology 1.

The chief subject matter topics covered were: instincts, capacities, self-activity, self-direction, habit (including the acquisition of skills), judgment, perception, memory, improvement and individual differences. These were utilized in the solution of problems and in the furthering of project.

The course was opened with a brief consideration of the field of educational psychology and the students were encouraged to list such of their questions as seemed to them to have bearing on this field. Of these questions, those which most directly pointed to introspection were given preference. Their consideration naturally led to the general problem of what we do when we study. After a preliminary consideration of these problems, the students were asked to list exactly what they did when they studied. A classification of these lists showed the following numbers mentioning the employment of the various factors. There were forty-five students in the class.

Physical conditions by 20
Having purposes by 14
Reading ability by 6
Supplementing statements by 13
Organizing to show full values and relationships by 23
Memorizing by 13
Using as a final step by 2
Preserving individuality by 1

Maintaining an Open Mind

It is probable that certain, and perhaps several of these forty-five students were employing, at least to a degree, more of the factors

than the above list would indicate. However, their statements were interpreted liberally and the above table shows all that their responses, as made to a specific assignment, would justify.

After having listed their procedure in study, each student was furnished with the arrangement of the factors of study as shown in form I and each graded himself by filling out this form.

These forms as filled were collected to prevent the students from being unduly influenced by their first gradings when they were asked to regrade themselves later in the term. This precaution was also taken regrading the second gradings.

As aid to further detail of study and a fuller appreciation of the respective factors, the first seven factors were outlined as indicated under II form.

HOW TO STUDY

Name of Student.....

Education 6

Form I. Records of Capability in the Main Factors.

(Note: After a brief survey of the problem, each student will write in his own way what he does when he studies. Then, after a brief explanation of the following classification of factors, each student will hold his statement of his own study procedure before him and score himself by placing crosses (x) in appropriate squares. After the factors have been studied intensively and applied, other records of capability will be made).

The main factors in study	Ratings of capability				
	Poor	Fair	Good	Very good	Excellent
1. Favorable Physical Conditions....			×		
2. Having Purposes.....			×		
3. Reading Ability.....			×		
4. Supplementing Statements.....			×		
5. Judging the Worth of Statements..			×		
6. Organizing to Show Values and Relationships.....			×		
7. Memorizing.....			×		
8. Using as the Final Step.....			×		
9. Preserving Individuality.....			×		
10. Maintaining an Open Mind.....			×		
11. Other Helpful Habits.....			×		

Record with crosses (x) made ..... 1920.
Record with checks (✓) made ..... 1920.
Record with circles (0) made ..... 1920.

Form II. A Detailed Survey of the Main Factors in Study.

(Note: References will be cited by abbreviations: *D* Dewey's *How We Think; H*—Hall-Quest's *Supervised Study: K*—Kitson's *How to Use Your Mind; M*—McMurry's *How to Study* and *Teaching How to Study; S*—Sandwick's *How to Study and What to Study; St*—Starch's *Educational Psychology; Wh*—Whipple's *How to Study Effectively; Wi*—Wilson's *Motivation of School Work.* The references to Whipple are by rule—with others, Roman numerals refer to chapter, Arabic to pages).

1. Physical conditions	Ratings of capability					
	Poor	Fair	Good	Very good	Excellent	Chief references
(1) Physiological, Health, etc..						
a. Hygiene of Nervous System.....						H 64–74 Wh 1, 10 S 22
b. Freedom from Physical Defects.....						Wh 2
(2) Environmental.....						Wh 3 H 75–83
a. Light, Temperature, etc.						Wh 4
b. Place.....						Wh 4 S 23–27
c. Time.....						H 161–166
d. Absence of Distractions.						St 181 H 91
2. Purposes.....						
(1) Compelling.....						Wi I-IV Wh 12 M 36–46
(2) Specific.....						M 31–36 W 15
(3) Intrinsic.....						

Record with crosses (x) made..... 1920.
Record with checks (✓) made..... 1920.
Record with circles (0) made..... 1920.
Name.....

One of the assignments in connection with the study of the physical factors was to list items of improvement. These were listed in two different assignments two weeks apart.

As indicated in table I, forty-five students reported 190 improvements and 24 additional needs for improvement.

Under the factor, "Purposes," much was made of instincts and interests as furnishing the original purposes of man, and of self-activity as the condition under which desirable purposes operate. Reading abilities furnished the largest field for utilizing help from educa-

TABLE I

Items of improvement in the physical factor

	1st wk. in Oct.		3rd wk. in Oct.	
	Accepted	Needed	Accepted	Needed
Environmental conditions:				
Better ventilation	3	1	5	
Regulation of temperature	5	2	5	1
Correction in lighting	23	4	12	
Readjustment of furniture	15	3	8	2
More quiet surroundings	10	4	8	1
Forming place-study habit	6	4	8	1
Forming time-study habit	16	7	12	3
Bodily conditions:				
Systematic exercise	...	6	5	7
Regular sleep	9	7	3	4
Rest between applications	...	3	2	1
More comfortable clothing	1	2	3	
Better habits of eating	2	..	3	1
Erect posture in study	3	..	1	
More orderly equipment	4	3	4	2
Correction of defective eyesight	1	1	4	
Work done on teeth	...	2	3	
Improvement in general health	6	2	2	2
Totals	104	47	86	24
	...	..	104	
GRAND TOTALS	...	..	190	24

tional psychology. This is considered somewhat in detail below. The most direct psychology help in supplementing statements was found in the nature of the apperceiving process and in the nature of the mental processes required for elaboration. The psychology of judgment, self-direction, etc., aided in the judging and organization factors. Under memorizing were considered memory as an inherited capacity, and means of improving in memorizing.

As the nature of the eighth, ninth, and tenth factors of study as listed places them most definitely in the field of the principles or philosophy of education, they were not specifically taken up in this course.

The work of the course afforded most help in the factor, silent reading. This help was sought through the employment of two means, (1) controlled practice, (2) study of the Psychology of the Silent Reading Process. The chief topics of study were:

Reading as a tool in study
Relation of rate to comprehension
The importance of adequate motivation
Instincts and capacities involved in reading
Relation of reading to language instinct
The element of habit in reading
Perception of meaning
Eye movements
The effect of articulation
The neurone-synapse-bond hypothesis
The work curve.

The practice means of improvement consisted of approximately thirty hours (fifty minutes each) in reading educational psychology and five hours in reading such material as appears in the first pages of the Outlook. About twenty hours of this practice—the practice in educational psychology—was spent in reading comparatively easy books such as Kirkpatrick's *Individuals in the Making;* Strayer and Norsworthy's *How to Study;* Seashores' *Psychology of Daily Life;* and the other ten hours of practice in educational psychology were in Thorndike's *Briefer Course.*

As measured by a test in reading educational psychology, the class as a whole increased their capabilities by more than one-half (½). And as measured by the Monroe Silent Reading Test with Stone's Extensions their average rate score after practice and study was 74 per cent gain over that of average scores before practice and study; and their average score in comprehension after practice and study was 84 per cent above that before practice and study. They gained nearly three (3) times as much in speed and fully three and a half (3½) times as much in comprehension as the check class. In terms of the median, the median student who did the practice and study had 180 per cent of the rate ability possessed by the median student of 405 typical equivalent students without training and study. And in comprehension, the median student of those who worked on this factor also had 180 per cent of the capability of the median of those without practice and study.

There were individual gains of over 190 per cent in comprehension and 160 per cent in speed. Contrary to the usual experience, students

with lowest initial scores made the greatest gains. The authors are unable to account for this fact.

The benefits of work on this factor as stated by individual students are summarized below:

A number of different factors are involved in any gains which were made in this continued exercise. Student's reports showed that different individuals gained because of different features of the plan. The old saying "Nothing succeeds like success" changed to read "Nothing aids reading like reading" may be applied to the results of this exercise. The fact that each student was required to read a definite piece of material for a definite length of time was a factor in the accomplishment of the task. More reading in the field of Educational Psychology was done by the class under the stimuli of the exercise than would ordinarily have been done according to the statements of the students. This practice was a good general aid in increasing the reading ability. Students were able to increase their power of concentration by following a definite program and bending every effort to concentration while they were reading. The factor of concentration seemed to be the most important item concerned in securing increased rate and comprehension. This fact was also very evident in a prolonged exercise of this type conducted with a class of high school boys. The boys seemed to be unable to concentrate and were reading their lessons several times in an attempt to get the content, but were not getting good results. After a few weeks of directed practice these high school students were able to get the thought from the text in much less time and the rate of reading increased remarkably. The students in this particular high school class held the opinion at first that those who read most slowly received more from the text than those who read very rapidly, but after the directed practice most of the students held a different opinion. They were able to concentrate better when the watch was held on them than when reading without such stimuli.

The directed practice in the case of the university class suggested certain mechanical aids to students who were eager to increase their rate. Such physical factors as position at the table or in the chair while reading were brought to the attention of the students. One student found that he could train the eye by using an ordinary postal card to cover the page, dropping it one line at a time as he read down the page, thus gaining speed in reading because the eye did not advance beyond the line to be read. While this device was not a

practicable one to be used continuously while reading it did seem to aid in developing speed in reading. The use of such a mechanical device seemed to train the eye in its movement though there is not proof enough to substantiate this claim. Many students said that they were aided most by the fact that they had set before them a definite piece of work to be done and that they worked against time to get it done. The practice obtained in this way seemed to give the same kind of results that the driver obtains when he trains the trotter to the mile track by constant practice.

Conclusions

The results of the course are believed to justify the following conclusions:

1. That a high degree of desirable motivation may be secured for educational psychology through "How to Study."
2. That "How to Study" may profitably serve as a main centre of interest and source of motive for a semester's course of three periods per week.
3. That the degree of improvement as illustrated by the factor, silent reading, is fairly startling.
4. That the plan of having students judge of their own capabilities notably increases their interest.

TWO IMPORTANT POINTS WITH REGARD TO AGE-GRADE TABLES

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The writer was much interested in the paper regarding age-grade data by Superintendent Witham in the November 1919 issue of the Journal, and in the further discussion by Superintendent Williams in the January 1920 number. There are two points with regard to age-grade distributions which seem to the writer very important, and which he wishes to mention briefly in this connection. Both these points may be examplified by reference to the two age-grade distributions presented below.

TABLE I

Age-grade distributions

City C

Age	1	2	3'	4	5	6	7	8	9	10	11	12	Total	Age
5	2	...	...	...	...	...	..	..	...	..	..	..	2	5
6	60	2	...	...	...	...	..	..	...	..	..	..	62	6
7	60	40	2	...	...	...	..	..	...	..	..	..	102	7
8	34	57	37	2	...	...	..	..	...	..	..	..	130	8
9	9	30	60	35	1	...	..	..	...	..	..	..	135	9
10	1	22	19	58	29	...	..	..	...	..	..	..	129	10
11	...	6	14	41	50	21	1	..	...	..	..	..	133	11
12	...	3	8	29	39	38	25	1	2	..	..	..	145	12
13	...	...	3	9	22	28	29	24	8	..	..	..	123	13
14	...	...	1	4	2	18	28	25	38	3	..	..	119	14
15	...	...	...	...	5	5	4	13	27	15	2	..	71	15
16	...	...	...	...	...	...	1	5	25	25	14	3	73	16
17	...	...	...	...	...	...	..	..	1	12	16	27	56	17
18	...	...	...	...	...	...	1	..	1	1	9	16	28	18
19	...	...	...	...	...	...	..	..	...	..	..	8	8	19
20–21	...	...	...	...	...	...	..	..	...	..	1	3	4	20–21
													1320	
Total	166	160	144	178	148	110	89	68	102	56	42	57	1320	

City F

Age	1	2	3	4	5	6	7	8	9	10	11	12	Total	Age
5	...	...	...	...	...	...	...	...	..	..	..	..	0	5
6	105	3	...	...	...	...	...	...	..	..	..	..	108	6
7	52	65	...	...	...	...	..	...	..	..	..	..	117	7
8	12	69	74	3	...	...	...	...	..	..	..	...	158	8
9	...	11	58	71	2	...	...	...	..	..	..	..	142	9
10	...	4	22	62	58	3	...	...	..	..	..	..	149	10
11	...	...	...	26	67	61	...	...	..	..	..	..	154	11
12	...	...	...	10	29	66	53	...	..	..	..	..	158	12
13	...	...	1	5	13	40	47	50	..	.	..	..	156	13
14	...	...	1	1	7	16	41	53	36	2	..	..	157	14
15	...	...	...	1	1	2	14	22	35	28	2	..	105	15
16	...	...	...	...	...	...	...	12	8	22	24	1	67	16
17	...	...	...	...	...	...	...	1	1	4	24	15	45	17
18	...	...	...	...	...	...	...	...	1	2	4	9	16	18
19	...	...	...	...	...	...	...	...	..	..	3	8	11	19
													1543	
Total	169	152	156	179	177	188	155	138	81	58	57	33	1543	

I. For many practical situations, the best single statement of the age-grade situation is in terms, not of per cent of retardation, but of median age per grade.

Superintendent Witham very properly complains of the lack of agreement among different school systems as to when and how an age-grade census shall be taken, as to what shall constitute retardation, and so on. As a matter of fact, he might well have complained also of the excessive labor involved in the study of the age-grade situation according to some of the methods at present in use. The census must be taken on such and such a day, the age being considered at such and such another day; the slow, normal and rapid-progress groups may be tabulated separately—and so on. And unless other age-grade studies use the same method, to the dot, comparisons are risky if not impossible. But is not the real fault with the unusual statistical method—percentage of retardation—in terms of which such data are usually expressed?

The writer has found that, for most purposes[1] a census taken at

[1] Not for all purposes, of course; important special influences may operate to make the age-grade situation somewhat different at different times in the year. But ordinarily the age-grade table is made primarily for the purpose of studying

practically any time of the year and handled in terms of percentiles, (particularly median age per grade) with allowance made in comparisons for differences in the time of year in which the study was put through, gave all the information desired. Thus, if one school system is studied in March and the other in May, comparisons can be made directly by simply adding two months to the median ages found for the system examined in March. The analysis of the age-grade tables given in Table I will serve as an example of the ease with which the important facts can be deduced with such a handling. As a matter of fact, the two cities were studied at the same time of the year, so any calculations to offset a difference in time of studying were not necessary; but, had they been necessary, the amount of .081 year would have been added to, or subtracted from, the median age of each grade for each month of difference between the two dates. The census was made in March. The median ages of each grade at that time were as follows:

Grade	1	2	3	4	5	6	7	8	9	10	11	12
City C	7.35	8.68	9.55	10.90	11.88	12.90	13.64	14.36	15.11	16.40	17.31	17.94
City F	6.80	8.12	9.06	10.25	11.42	12.45	13.52	14.36	15.13	15.97	17.10	18.06
Difference	.55	.56	.49	.65	.46	.45	.12	.00	−.02	.43	.21	−.12

Differences expressed in hundredths of a year perhaps do not look very surprising; but when it is realized that the children in the first grade of City C are nearly *six* months older than the same children in City F and that the children in grade 4 are over *eight* months older than those in City F, then things begin to look serious.

Such treatment of age-grade data (in terms of median age) thus makes possible fairly satisfactory comparisons even if the data were not obtained at the same time of year. But there are other advantages. Summary of the tables in terms of central tendency is much more suited to the major problem under consideration. It is surely this difference in the age of the average child that is the important difference, in comparing schools with differing rates of retardation. The important point is not that some of the children are backward, or retarded

the larger general facts and trends of the movement through the grades. And for such purposes it makes (so far as the writer has been able to observe) relatively little difference what time of the year the census is taken, providing only that it is not made too near either end.

according to some set standard, but that, *on the average*, the children take longer to reach a certain grade in one system than in the other. And to compare averages in terms of per cent of cases at the extremes is surely an odd bit of statistical procedure, not calculated, either, to give a finding of the greatest reliability.[1]

Perhaps one does wish, however, to examine the extremes of the distribution, and to get some notion as to the comparative extent to which bright children are moved along rapidly and dull ones are held back. This may be done by finding the percentage of "retardation" and "acceleration." But why not, instead, calculate the ten and ninety percentiles? A comparison of the two cities studied in this way is made in the tables presented below.

Grade	10 Percentiles											
	1	2	3	4	5	6	7	8	9	10	11	12
City C	6.24	7.35	8.34	9.45	10.48	11.53	12.32	13.25	14.00	15.17	16.16	17.10
City F	6.16	7.19	8.21	9.21	10.27	11.26	12.29	13.28	14.22	15.14	16.15	17.15
Differences	.08	.16	.13	.24	.21	.27	.03	−.03	−.22	.03	.01	−.05

Grade	90 Percentiles											
	1	2	3	4	5	6	.7	8	9	10	11	12
City C	8.80	10.68	11.83	12.83	13.64	14.66	14.90	15.86	16.66	17.61	18.65	19.66
City X	7.91	9.00	10.38	11.96	13.25	13.98	14.96	15.96	16.23	17.05	18.33	19.59
Differences	.89	1.68	1.45	.87	.39	.68	−.06	−.10	.43	.56	.32	.07

These tables give us much further information with regard to the two school systems. They suggest that the reason that the children are, on the average, so much older in City C is, not because the whole distribution is higher, but because the children who have once dropped behind are so severely dealt with. This is, of course, another way of saying that City C has a very high percentage of "retardation," as compared with City F, but about the same "acceleration," however, the method described above is statistically much

[1] The method is surely much more sound than an attempt to get at promotion rates indirectly, from the age-grade table, by means of "percentages of retardation" calculated from such tables. But more than this the writer is inclined to believe that these median ages are rather more informing, in giving the large facts of the situation, than a direct study of promotion rates would be.

more exact and sound.[1] Or to put still another face upon it, the range of ages in a given grade in City C is much greater, particularly for the second and third grades, where the distance between the 10 and 90 percentiles is almost twice as great in City C as in City F.

It would surely be interesting if we had thoroughly worked out standards for median age per grade and also standards for other points on the distribution, either the 10 and 90 percentiles or the quartiles,—from which, of course, could be deduced standard ranges. In fact, some measure of the dispersion of the ages of the children in a given grade would seem highly desirable. Statements in terms of percentage of retardation give us neither dispersion nor central tendency; the method is, in fact, extremely odd statistically—as well as inconvenient. The writer would strongly urge, instead, the treatment of age-grade data according to some such standard statistical procedure, as both more convenient and more sound. In fact, such treatment often brings out facts which would hardly be found otherwise.

II. Differences in Age-Grade distribution, from school to school and from system to system, must always be taken account of in using tests; this can best be done in terms of median age per grade.

Again the distributions of Table I will serve as an example. Grade norms obtained in one city are essentially impossible of application in the other, unless some allowance is made for differences in the age-grade situation. The fourth grade children in City C average about 8 months older grade than the fourth grade in City F. The fourth grade in City C is obviously *not* a comparable group, then, with the fourth grade in City F, so far as maturity is concerned. But a close study of the distributions will show other differences. In City C the children tend to be held in the first three grades; in the second city the incidence of retardation is in the fourth and fifth grades. The selection for the upper grades is also different in the first city. There are practically the same number of children in the first grades of the two cities, (166 and 169 cases, respectively); only 41 per cent of this number are in the eighth grade in the first city, compared with 62 per cent in the second city. It is clear that grade

[1] That is, more sound as a method of summarizing the age-grade table. An actual study of retardation and acceleration (that is, number who have been retarded and accelerated) is a different matter; for certain purposes such an actual enumeration of the retard and accelerates is undoubtedly desirable. But such an actual retardation study is a different matter from an age-grade table summarized in terms of "retardation."

norms established in one place *cannot* be applied indiscriminately elsewhere.

This is, as a matter of fact, coming to be quite generally recognized and, instead of grade norms, we find age norms being used. The writer believes this move rather unfortunate, because age norms are even more difficult matters than grade norms. And again, a study of Table I will show why. Suppose, for instance, a test in the fundamentals of arithmetic or a test in silent reading should be given from the third through the eighth grade. This is a somewhat unusually long range for a test of achievement, but such a test will illustrate the difficulties of age standardization under even the most favorable circumstances. The question then is: "Can satisfactory age norms be obtained, if all the children in the system, from the third through the eighth grade, are examined with this test?" It should be noticed, in the first place, that in City C there is *not one single age* at which all the children, of that age, will be included in the norms. In this city, 63 per cent of the eight-year-olds, 35 per cent of the nine-year-olds, 18 per cent of the ten-year-olds, 5 per cent of the eleven-year-olds, 3 per cent of the twelve-year-olds, 6 per cent of the thirteen-year-olds, 35 per cent of the fourteen-year olds, would not take the examination at all. And, unless a census on that day were taken of the entire school system from the first grade through high school, it would not be possible to allow for these losses, because the examiner would have no way of knowing how many he had missed. In City F, the situation is distinctly different. All eleven, twelve, and thirteen year old children would, if the examination were given at this particular time, be tested; 51 per cent of the eight-year-olds, 8 per cent of the nine-year-olds, 3 per cent of the ten-year-olds, and 24 per cent of the fourteen-year-olds would not take the test, in this city. Surely no one can believe that, under such circumstances general age norms can be established, or reasonable comparisons made from school to school or system to system. If the test covers, as most achievement tests do, only two or three grades, the situation is even more hopeless. A test given to the Junior High School of City C would not test more than 45 per cent of the children at *any* age. A similar test in City F would get scores from 62 per cent of the thirteens, the highest per cent at any age.

There is a further factor of great interest to be considered here. In City F practically all the fourteen-year-old children are in school; there are 158 twelve-year-olds and 157 fourteen-year-olds. But in City

C there are 145 twelve-year-olds to 114 fourteen-year-olds. The elimination has begun to show, in fact, at thirteen, there about 20 less thirteen-year-olds in City C than one would expect. And, to glance a moment at the other end of the age situation, the first city shows only half the expected number of six-year-olds, whereas in City F there are about 75 per cent the expected number. The situation seems hopelessly complicated and special, and the obtaining of any general age norms practically impossible.[1]

What is the solution of the difficulty? The best way out of it, to the writer's mind, is not to attempt age norms at all, in work with tests of achievement, but to give instead, with the grade norms, the median age of the grade. This will permit of allowance for differences in the age-grade make-up of different schools. It will also largely allow for differences in selection, since high selection for the upper grades, and excessive elimination, usually go with a high retardation. There will, incidentally, be no more opportunity for the school with the high retardation to come out triumphant on tests. Further, allowance can more easily be made for testing done at different times of the year. In short, a simple statement of median age per grade will (the writer believes) add much more to the usefulness of norms, for tests of either intelligence or achievement, than may at first be realized.

[1] It may also be added that the different schools within a single school system are likely to differ even more than two separate systems. For a further discussion see: Pressey, S. L.: A comparison of Two Cities and Their School Systems by means of a Group Scale of Intelligence. *Ed. Ad. and Super.*, Feb., 1919; or The Problem of the Unselected Group in the Standardization of Tests. *Jour. Appl. Psych.*, Dec., 1920.